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ABSTRACT

The returns that Kentucky can expect on its investments in higher education were examined in an analysis that identified some of the social benefits accompanying earning a degree from a four-year college and established a value for those benefits. The analysis was based on 12 models that were estimated by using datasets from semiannual surveys of Kentucky residents conducted by the University of Kentucky Survey Research Center. The following were among the benefits identified: (1) economic benefits in the form of higher earnings and higher state and federal tax revenues to fund tax-supported programs; (2) reduced welfare dependency; (3) lower crime costs; (4) healthier lifestyles; (5) social gains, including increased volunteerism, charitable giving, and participation in and leadership of community organizations; and (6) various immeasurable benefits, including reading to children and increased levels of participation in cultural activities. The lifetime social benefits of a four-year degree were estimated at more than $126,000 for men and $96,000 for women. (Twenty tables/figures are appended. The following items are appended: (1) descriptions of the Kentucky survey data and models; (2) an estimate of the additional federal and state tax revenues resulting from participation in higher education; and (3) expected costs of incarcerating men and women in Kentucky.) (MN)

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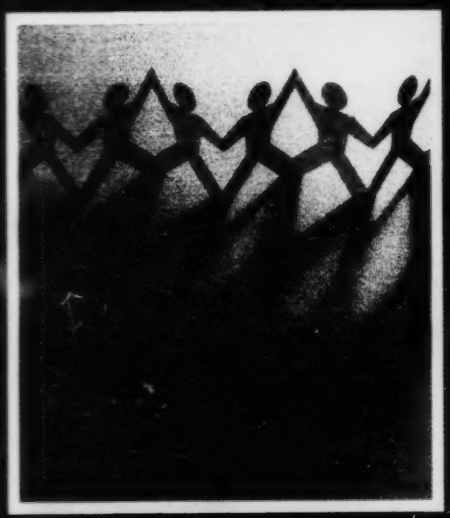
Social Benefits of Higher Education in Kentucky



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Education and the Common Good

Social Benefits of Higher Education in Kentucky

by
Amy L. Watts

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PREFACE

As part of its mission to advise and inform the Governor, the General Assembly, and the public about the long-term implications of policies, the Kentucky Long-Term Policy Research Center reports the wider implications of the Commonwealth's increased investments in postsecondary education in recent years, as exemplified by the Postsecondary Education Improvement Act of 1997. We find that the benefits resulting from investments in postsecondary education are far-reaching and substantial. While our analysis examines and discusses the benefits resulting from increasing educational attainment from the high school diploma to the baccalaureate degree, one should not necessarily infer that it is better or more cost effective to invest in postsecondary education than, for example, early childhood development, primary and secondary education, or vocational and technical training. From policymakers at every level to ordinary citizens of the Commonwealth, all who are interested in and concerned about the future of the state will find this report of interest.

KENTUCKY

LONG-TERM POLICY RESEARCH CENTER

The Kentucky Long-Term Policy Research Center was created by the General Assembly in 1992 to bring a broader context to the decisionmaking process. The Center's mission is to illuminate the long-range implications of current policies, emerging issues, and trends influencing the Commonwealth's future. The Center has a responsibility to identify and study issues of long-term significance to the Commonwealth and to serve as a mechanism for coordinating resources and groups to focus on long-range planning.

Michael T. Childress serves as the Executive Director of the Kentucky Long-Term Policy Research Center. Those interested in further information about the Center should contact his office directly at:

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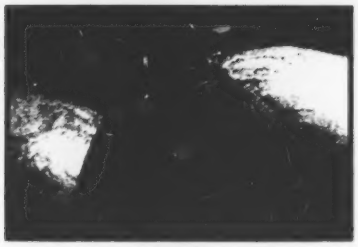

SUMMARY

Education pays—and virtually everyone knows it. It surprises few to learn that a graduate of a four-year college earns more over a lifetime than someone with a high school diploma or that the high school graduate earns more than the dropout. But a higher lifetime income is not the only positive outcome of earning a bachelor's degree or higher. A range of other societal benefits accrue, from better health to increased voluntarism. These derivative benefits are less well-known, and they are far more difficult to evaluate than wages. However, such an evaluation is important for Kentucky's leaders. The state has made a substantial and sustained commitment to raise the level of education among Kentucky residents. An important question to answer is what return the state can expect for the investment it is making in the education of its citizens.

OUR PURPOSE

This report attempts to answer that question. It does so by, first, identifying some of the social benefits that accompany earning a degree from a four-year college and then establishing a value for those benefits. While increasing education at any level has value, we focus only on the benefits of earning at least a baccalaureate degree from a four-year institution. Having evaluated the benefits, the report then determines the cost of attaining that degree, using as the basis the cost of attending one of the eight publicly supported colleges in Kentucky.

OUR FINDINGS

Our analysis shows higher education yields a number of benefits. They range from straightforward economic gains to less tangible returns that, in turn, benefit the larger society by reducing public costs.

Economic Benefits. Historically, the most obvious benefit derived from a college education is that of higher earnings. A previous study finds benefits accruing directly to the average Kentuckian through higher earnings associated with more schooling. Our analysis also shows that the income taxes paid by more educated Kentuckians benefit the state and, by extension, those citizens who rely on tax-supported programs.

The wage benefit is substantial. Compared with a high school graduate, for example, a man with a baccalaureate degree will earn $357,000 more over his lifetime, and a woman will earn $158,000 more. In turn, these higher earnings imply increased state general fund revenue and broad benefits. An individual with a bachelor's degree will contribute almost $23,000 more to state coffers over the course of a lifetime than one with only a high-school degree. The federal government will receive more than three times that amount.

Reduced Welfare Dependency. When we consider other social benefits, our research shows that those with a four-year college degree or higher do not draw from public assistance programs at the same rate as their less-educated peers. Analyzing two programs, welfare and food stamps, we find that the annual savings that accrue from a four-year degree are more than $1,700 annually for a woman and almost $1,600 for a man, both age 30.

Lower Crime Costs. Crime may not pay, as the old saying suggests, but it certainly costs. The annual cost to the state of Kentucky to incarcerate an individual in a state correctional facility is nearly $20,000 a year. Moreover, the cost for all correctional facilities in the state exceeds $300 million a year. Any reduction in this significant public burden would be welcome news.

Our analysis reveals a negative correlation between education and incarceration rates. The more educated the person, the less likely he or she is to be incarcerated in a state prison. Naturally, the demand they place on the criminal justice system is also less and significantly so. To illustrate, a male high school dropout can be expected to cost the criminal justice system over $8,500 in his lifetime compared with just over $200 for a man with at least a bachelor's degree.

Healthier Lifestyles. The more educated segment of the population also tends to make healthier lifestyle choices. In part, this occurs because members of this group do not smoke as much as those in the less-educated category. Smoking has been linked to the leading causes of death in this country (lung cancer and heart disease). Reducing these costs is a particularly important issue for Kentucky, which, until recently, led the nation in the percentage of adults who smoke and continues to have high smoking rates among youth.

The public costs of treating smoking-related illnesses are onerous. In 1993, expenses attributed to smoking were estimated at $1 billion in the Commonwealth. Over subsequent years, health care costs have risen significantly.

We find a clear relationship between education and the likelihood that an individual will smoke. The probability of having smoked in the past 30 days declines 14 percentage points (from 34 to 20) when we compare college graduates with high school graduates. The decline is even greater in the comparison with those with less than a high school diploma.

Social Gains. The social benefits described above are, in a sense, negative ones; that is, more educated citizens *don't* often rely on welfare and food stamps,

don't commit crimes at the same rate as those with less education, and *don't* smoke as much. But what about positive benefits? They are many, perhaps too many to identify, much less quantify.

Many fall into the category of civil society, which includes such things as voluntarism, charitable giving, and participating in and leading community organizations.

Civic Contributions. College-educated community members are more likely to participate in groups and almost twice as likely as the person with a only a high school diploma to lead them. The sense of community also manifests itself in charitable giving and volunteer activities. Those with high school diplomas give to charity at a high rate (83 percent), but those with college degrees do even better (93 percent). Volunteer hours reflect a similar pattern, with more educated Kentuckians donating well over 100 hours annually, which represents a lifetime value of more than $41,000 for the typical Kentucky woman and $39,000 for a man. They also lead their peers with only high school diplomas in registering to vote, although the distinction is not as sharp as in some other areas (88 percent to 93 percent).

Immeasurable Benefits. Still other positive outcomes are associated with completing college, although they are difficult to value. For example, reading to children has been shown to have a positive effect in preparing them to do well in school. Surveys conducted by the Kentucky Long-Term Policy Research Center show that most parents who have children under age eight read to them, but parents who are college graduates tend to read to their children more frequently.

We also find that more educated Kentuckians are more comfortable with computers and the Internet. Over 60 percent of those with bachelor's degrees have access to a computer at home (compared with 44 percent for high school graduates) and they use the Internet at almost twice the rate of their high school counterparts. Finally, they tend to participate in cultural activities more frequently.

Cost and Benefit

While some of the benefits of increased education are difficult to quantify, many are not. A comparison between the dollar value of the benefits and the cost of obtaining a bachelor's degree compared to those associated with a high school diploma is one way of quantifying the benefit of increasing education levels.

The lifetime social benefits of a four-year degree or higher differ by gender, but they are substantial in either case. Counting only state and federal taxes, savings in welfare and the criminal justice system, and additional benefits from voluntarism, our analysis shows that the total present value for a man is more than $126,000 and more than $96,000 for a woman.

On the cost side, the analysis reveals present value costs of about $24,626. This includes only state General Fund support of instructing a student for four years at one of Kentucky's eight publicly supported higher education institutions.

Thus, on a dollar basis, a four-year college degree represents a sound investment for society, one that clearly pays returns over the long term. And this comparison does not take into account the less tangible benefits associated with higher levels of education such as better health, higher rates of reading to children, and greater use of the Internet. This is not to say that it is better to invest in higher education than it is other programs that benefit the state's citizens such as early childhood development. It does, however, demonstrate in concrete terms a portion of the overall value to society of Kentucky's commitment to raising the education level of its citizens.

GLOSSARY

Social Benefits of Education — Phrase referring to the benefits of education other than the enhancement of labor market productivity and earnings.[1]

Present Value — Present values of future dollar amounts adjust for the "time-value of money," to account for the fact that dollars received in the future are worth less than those received today. Present value calculations discount future benefits and costs to the present to reflect most people's preference to consume now rather than later. This report assumes an 18-year-old high school graduate and a 22-year-old college graduate; accrual of benefits are calculated accordingly. The formula used in this report to calculate present value is:

$$PV = \sum_{i=1}^{n} \frac{values_i}{(1+rate)^i}$$

where *PV*=present value, *i* is the year, *values* are the dollar values of the benefit being measured for that year, and *rate* is the discount rate.

Expected Value of Benefits — A combination of the probability a person engages in an activity and the value of that activity. In this report, most of the estimated benefits are contingent upon participation in the activity garnering the specified benefit. For example, not everyone in our sample volunteers. We only receive the value of extra volunteer hours associated with educational increases if the person actually volunteers. Therefore the values we present take into account the likelihood someone will volunteer and the benefit to society upon realization of that activity.

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[1] This definition is taken from Jere R. Behrman and Nevzer Stacey, eds., *The Social Benefits of Education* (Ann Arbor, MI: University of Michigan Press, 1997). While this phrase may have different meanings to different people, we chose this definition to differentiate between those benefits that primarily accrue to the educated person in question and those benefits that accrue to those not directly involved in the process of educating that person. Since the educated person in question is technically a member of society, social benefits could include those the person enjoys privately, such as earnings. In fact, many studies use the enhancement of earnings as the sole measure of social benefits. See, for example, Larry L. Leslie and Paul T. Brinkman, *The Economic Value of Higher Education* (New York, NY: Macmillan Publishing, 1988): 70, and Walter McMahon, "Relative Returns to Human and Physical Capital in the U.S. and Efficient Investment Strategies," *Economics of Education Review* 10.4 (1991): 284-296. However, in an effort to expand the discussion of educational benefits beyond the well-known earnings enhancement outcome, this report focuses on the lesser-known effects associated with more schooling and their subsequent societal impact.

Instructional Costs of Higher Education — Funds spent on the direct instruction of a student. The types of activities for which this money is expended include faculty and staff wages and salaries and plant operation and maintenance (for example, general maintenance of buildings used for instructional purposes).

Noninstructional Costs of Higher Education — State budgetary appropriations to institutions of postsecondary education spent on activities not directly related to student instruction. These types of activities include research conducted beyond the normal departmental research that is essential to teaching excellence and also public service.

FTE Enrollment — Full-time equivalent enrollment. FTE enrollment is computed as follows: total full-time undergraduate headcount enrollment plus one third part-time undergraduate headcount enrollment.[2]

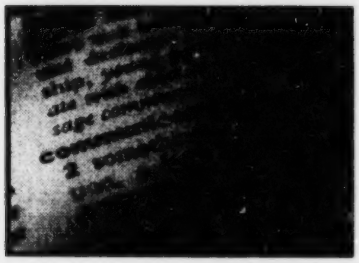
[2] There are many methods for calculating full-time equivalent enrollment. The Council on Postsecondary Education uses this method, which was developed by the Integrated Postsecondary Education Data System (IPEDS), for the cost figures used in this report to estimate the average cost of going to college in Kentucky. The Council also uses a method from the Southern Regional Education Board and one from their own Comprehensive Data Base.

ACKNOWLEDGMENTS

The author would like to thank the many individuals who contributed their time and effort so generously to the production of this report. Many individuals carefully reviewed an earlier version of this draft. Their insightful comments were invaluable in the preparation of a much improved final report. Those persons are Richard Krop, who has published related works in this field as a former analyst with the RAND Corporation; James R. Ramsey, Senior Policy Advisor to Governor Patton and State Budget Director; Bob Cox, Deputy Director for Economic Analysis and staff members of the Legislative Research Commission. I would like also to thank my fellow staff members at the Kentucky Long-Term Policy Research Center, Billie Sebastian, Mark Schirmer, and Suzanne King for their expert proofreading, layout contributions, and editorial support. I would also like to thank Michael Childress, Executive Director, and Michal Smith-Mello, Senior Policy Analyst, both of the Kentucky Long-Term Policy Research Center for their important contributions to the content, wording and layout of the report. Jerry Sollinger wrote the executive summary and he, along with Charlie Bush provided much valued proofreading and editing. As always, our Board provided timely comments and ongoing support for which I am most grateful.

Several representatives of cabinets and agencies throughout state government were helpful in gathering data and information. I would like to thank Linda Jacobs of the Council on Postsecondary Education for her help in gathering cost data and for her patient explanations of the intricacies of higher education financing. I am very grateful to Patrick Kelly, also of the Council on Postsecondary Education, for his help in collecting and explaining critical statistics on the health of Kentucky's higher education system. I would also like to thank Bill Clark of Kentucky's Department of Corrections for his help in obtaining cost data for Kentucky state prisons. Others who were helpful in providing valuable information and data for the final publication of this report include Wendell Butler of the Kentucky Revenue Cabinet; Ellen Hahn, Associate Professor College of Nursing at the University of Kentucky; Lee Nimocks, Director of State Relations and Communications for the Association of Independent Kentucky Colleges and Universities; and Michael Morrison of the Kentucky Cabinet for Families and Children.

While many individuals contributed to the content and structure of this report, the Kentucky Long-Term Policy Research Center assumes full responsibility for its content.



INTRODUCTION

Education should not compete with national defense, the trade deficit, drugs or AIDS. Instead, think of it as a solution to those problems.

—David Kearns
Chairman of Xerox Corporation

Heralded throughout the latter half of this century as a passport to opportunity, higher levels of education are consistently accompanied by higher wages and salaries and thus by higher standards of living. Indeed, with each incremental increase in the level of education, we see a corresponding increase in income. While a desirable goal for any state, higher levels of education are vital to Kentucky's future. Throughout much of the 20th century, however, Kentucky gave scant attention to the importance of education because our economy offered jobs and economic rewards to the undereducated. While jobs for the less-educated remain abundant, they, as a rule, no longer enable prosperity. Indeed, the demands of today's economy are altogether different. Ultimately, the level of intellectual capital we bring to this economy, the portion of our population that is college educated for the Information Age, will determine whether our standard of living improves.

In recent years, the Commonwealth has begun to focus intently on ways of improving the state's educational status through investment and commitment to key long-term goals. As in most states, higher education occupies an important position in the eyes of Kentucky policymakers, representing approximately 16 percent of state General Fund expenditures in recent years.[3] This substantial investment is justified in part by the considerable demands of the emerging information-based and technology-driven economy, which requires workers with sophisticated skills and the ability to adapt to a fast-paced, rapidly changing environment. To succeed in this new, knowledge-based economy, workers must have critical thinking skills, including the capacity to innovate and think entrepreneurially. But the returns to the Commonwealth will extend well beyond improvements to the capacity of our labor force.

The higher standard of living that accrues to an educated populace involves much more than the obvious economic rewards, which are considerable. Less well-known but arguably more important are a broad range of social benefits that are clearly associated with having a more educated populace. Over the long term, research suggests, improved educational status will result in a broad range of

[3] Ron Carson, *Kentucky Higher Education General Fund Expenditures as a Percentage of Total General Fund Expenditures: 1982-2002*, (Frankfort, KY: Council on Postsecondary Education, 2001).

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benefits to society, many of which may be unanticipated. The social benefits of education emerge in areas as diverse as public health, civic capacity, and technological use. Although complex and not fully understood, the strong links between education and social outcomes such as these suggest that our state has been diminished in many ways by its poor educational status. But just as we have incurred enormous and ultimately incalculable losses due to a sustained inattention to education, we have much to gain from investments in education at all levels. Here we focus on the gains attributable to investments in education beyond the secondary level.

The recent passage of legislation to reform Kentucky's postsecondary education system brought sweeping change in hopes of creating a system that will enhance Kentucky's educational achievement and bring greater prosperity to all its citizens. However, these reforms will not come cheap. In aggregate, increases in spending by state government, as well as by students and their families, will be necessary to reach the goals set by this ambitious legislation. As public funding for higher education increases, so will public scrutiny. The usual targets of such scrutiny are the returns from such a substantial investment. That is, skeptics will ask whether the benefits of increasing the educational attainment of more Kentuckians beyond the secondary level outweigh the costs. Or, more pointedly, will improvements in postsecondary education improve the lives of all Kentuckians?

With this report, we attempt to answer this question, to measure the value of some of the unanticipated gains or social benefits of education, and to determine whether the significant investment we are making in higher education here in Kentucky is rewarded by the social returns to our state. This report seeks to identify some of the many social benefits associated with "going to college" and value a select few. To estimate potential returns to higher education for Kentucky, we then incorporate these values into an illustrative cost-benefit analysis.

Finally, we focus on the socially beneficial outcomes of increasing educational attainment from a high school diploma to at least a baccalaureate degree. Significant gains are realized at every educational level, including postsecondary education and training that does not necessarily lead to a baccalaureate degree. However, for the sake of illustration and simplicity, our cost-benefit analysis examines only those costs and benefits attributable to a four-year degree or higher.

CAVEATS

There are three important points one should keep in mind while reading this report. First, correlation does not necessarily imply causation. Second, we do not know whether our sample respondents actually attended a Kentucky college or university. Third, most of our estimated benefits are based on attaining a bachelor's degree or higher, but our estimated costs are calculated on four years of college.

We statistically analyzed the association between education, particularly higher education, and a variety of social benefits. The statistical association between educational attainment and these outcomes does not necessarily imply causation, since other confounding factors may lead to the statistical association we observe. However, we rely on generally accepted theories and evidence from similar studies to construct our models and control for as many of these confounding factors as the data will allow in order to make reliable inferences from our results.[4] In particular, our models indicate that as the overall level of college-educated adults increases in Kentucky we will observe an associated change in the outcomes selected for our analysis—the benefits of which will accrue to the whole of society.

In most cases, regression analysis models will help demonstrate the *independent* relationship between education and the benefits analyzed.[5] Regression analysis is a statistical technique that enables us to say, "All other things being equal, an increase in educational attainment is associated with the probability that a person will volunteer by X percent." Or, "Even when age, gender, etc. are the same, the expected food stamp benefits of a college graduate are $X less than those of a person with a high school diploma." Separate statistical models predict the associated increase in the benefit analyzed as education increases from the high school diploma level to a bachelor's degree or higher. The same basic explanatory variables, with slight variations among some of the models, are used throughout the modeling process. Data on age, gender, race and ethnicity, income and the urbanity (or rurality) of each person or observation were used to control for these confounding factors and isolate the effect of each explanatory variable on the likelihood or amount of the benefit analyzed.[6]

Second, we do not know whether our sample respondents actually attended a Kentucky college or university. Most of our data come from surveys of Kentucky

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[4] For more information on the basis of our conceptual framework see T.W. Schultz, "Education and Economic Growth," in *Social Forces Influencing American Education*, N.B. Henry, ed. (Chicago: National Society for the Study of Education, 1961); J. Mincer, "On the Job Training: Costs, Returns, and Some Implications," *Journal of Political Economy*, 70 (1962): 50-79; Gary Becker, *Human Capital* (1964; New York: National Bureau of Economic Analysis, 1975); Kenneth Arrow, "Higher Education as a Filter," *Journal of Public Economics*, 2 (1973): 193-216; A.M. Spence, *Market Signaling: Informational Transfer in Hiring and Related Screening Processes*, (Cambridge, MA: 1974); A.M. Spence, "Competition in Salaries, Credentials, and Signaling Prerequisites for Jobs," *Quarterly Journal of Economics*, 90.1 (1976): 51-75; Richard A. Krop, *The Social Returns to Increased Investment in Education: Measuring the Effect of Education on the Cost of Social Programs*, (Santa Monica, CA: RAND Graduate School, 1998); Georges Vernez, Richard A. Krop and C. Peter Rydell, *Closing the Education Gap: Benefits and Costs*, (Santa Monica, CA: RAND, 1999); Behrman and Stacey, eds. 1997; V. Hodgkinson and M. Weitzman, *Giving and Volunteering in the United States; Findings from a National Survey* (Washington, DC: Independent Sector, 1988); A. Campbell, P.E. Converse, W.E. Miller and D.E. Stokes, *The American Voter*, (Chicago: University of Chicago Press, 1976).

[5] Data limitations in the criminal justice analysis hindered our ability to use regression analysis. For these estimates, we used a different technique to value the relationship between education and the likelihood of involvement in the criminal justice system. See Appendix C for more information on data and methodology.

[6] See Appendices A and B for more details on data and methodology.

adults and reflect the benefits of all college-educated adults in Kentucky, regardless of where their education was obtained. If one were to select a person from one of our samples at random, there is a chance that person did not attend one of these eight publicly supported Kentucky schools. However, in 2000, the majority (88 percent) of Kentucky high-school graduates attending college the following fall went to in-state colleges. In addition, of *all* students attending college in Kentucky in 2000, 86 percent went to one of Kentucky's eight public institutions.[7] Kentucky has a relatively high rate of adults who are originally from this state—approximately 78 percent.[8] These statistics indicate a high likelihood that the persons in our samples attended a public institution in Kentucky and remained here upon graduation.[9]

Third, our benefits measure the attainment of a bachelor's degree or higher, whereas our costs measure bachelor's degree only. Picking an individual at random from one of our samples may yield someone who has attained a graduate or professional degree. In these cases, our current cost measures would underestimate the actual costs of a person with a degree higher than a four-year undergraduate degree. However, our current analysis shows that the estimated benefits exceed costs by a wide margin, allowing for a considerable increase in costs before the investment becomes unwise (See "Costs and Benefits of Higher Education").[10] The complexity of trying to account for these additional costs prohibits their inclusion in our final cost estimates. Our cost estimates accurately reflect the cost of providing the typical Kentuckian with four years of higher education.

All of these issues are important and worth mentioning, but the limitations described here do not undermine the central theme of this report—that higher education is a worthwhile investment. Our illustrative cost-benefit analysis shows that the social benefits of higher education outweigh society's costs of achieving a more educated Kentucky.

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[7] Our independent colleges are a vital part of the postsecondary education landscape of Kentucky and provide quality education to its citizens at a relatively low cost to the public at large. They do not receive direct funding from the state; however, the state does provide a valuable service to their students through financial aid. For the sake of simplicity we exclude their costs from our analysis.

[8] United States Census Bureau, 1990 Census on Population and Housing. This statistic is likely to be lower for the 2000 Census given the relatively high net in-migration to Kentucky over the last decade.

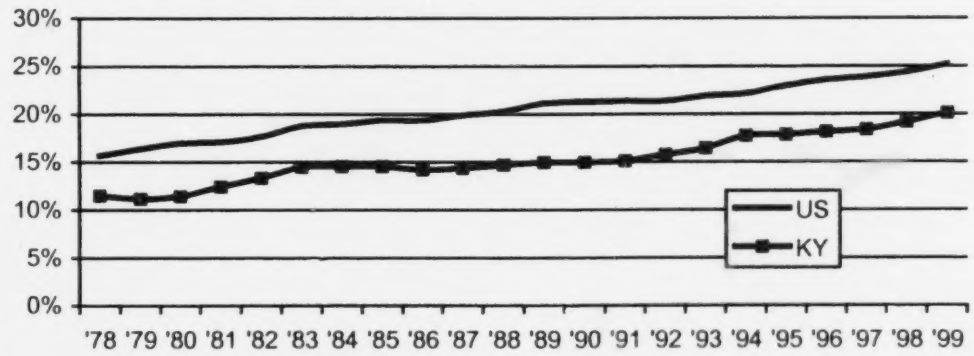
[9] Migratory patterns can affect the policies regarding who should get the state support—the student or the institution. If a large majority of our students attend or would like to attend out-of-state schools or independent colleges, the policy implication would be to fund the individuals rather than the institutions. If Kentucky simply needs college graduates, it could import them or export our students to other states and provide incentives for them to return. If most of the students intend to leave the state upon graduation, then we may want to rethink our level of public subsidization, since we would not be able to reap the full benefits of a more educated Kentucky. While these points are all important and worth mentioning they do not undermine the basic point of this report which is to illustrate the greater good a more educated populace can bring to the Commonwealth.

[10] Regarding education levels beyond the two-year degree or some college experience, survey respondents were asked to categorize their level of education as 1) a bachelor's degree only, 2) some graduate school work or 3) a graduate or professional degree. Due to the wording of the responses we were unable to separate a master's degree from a Ph.D. from a professional degree. In addition, sample sizes were prohibitively small.

An Overview of Higher Education in Kentucky

Most data show that the attainment of education beyond the secondary level among Kentucky's population has been poor. While its status has improved, the Commonwealth still ranks near the bottom in the portion of its adult population that has a college education. As of 2000, Kentucky ranked 42nd in the country in the percentage of adults 25 years old or older with a bachelor's degree or higher.[11] Figure 1 shows that over the past 20 years we have made considerable progress in this area, but continue to lag the nation's progress. The percentage of adults in Kentucky with at least a four-year postsecondary degree has increased by approximately 67 percent over the latter part of the century, from 12 to 20 percent, but falls short of the nation's average of 25 percent.

FIGURE 1
Percentage of Persons Age 25 and Older with a Bachelor's Degree or Higher, US and KY, 1978-1999



Source: Kentucky Long-Term Policy Research Center analysis of Current Population Survey data

[11] U.S. Census Bureau, March 2000 Supplement to the Current Population Survey, "Educational Attainment in the United States: March 2000," P20-536 (update), 3 Jan. 2001 <http://www.census.gov/population/www/socdemo/educ-attn.html>.

To close this gap, obviously more Kentuckians must enroll in postsecondary schools and persist until they graduate. Unfortunately, Kentucky falls short on these measures. In 2000, 56 percent of Kentucky's high school graduates entered college the following fall, compared with a national average of 65 percent.[12] The percentage of first-time degree-seeking freshmen who return one year later has been particularly low for Kentucky's eight four-year public universities, ranging from a high of 80 percent to a low of 61 percent in 2000.[13] With 20 percent to 40 percent of our first-time freshmen dropping out after only one year, student attrition can be a considerable drain on public resources that supplement the cost of educating college students.[14] Last, graduation rates are the final, critical step in approaching the national average of adults attaining a degree in higher education. In 1999, Kentucky's six-year graduation rate of 37 percent was lower than the 43 percent of first-time, full-time baccalaureate students graduating within *five* years nationally.[15] So, we not only have fewer college graduates, students also take longer to complete their education, which again drains the public resources that help meet the costs of a college education.

Policy responses at the state and the local level are remedying these deficiencies. The Commonwealth's leaders have taken numerous steps to elevate the quality of the state's educational infrastructure at every level, instituting a long-term quest for excellence and successfully improving educational achievement in the state. For example, in a special session of the General Assembly in May 1997, Kentucky passed the Postsecondary Education Improvement Act (House Bill 1), committing to changing the status quo and providing a structure to support that change. The statute created a new coordinating board, the Council on Postsecondary Education (CPE), to oversee the implementation of the Act's reforms. The Council recognized that the first step to increasing Kentucky's average level of educational attainment is to increase enrollments. Thus, the CPE set a target of increasing undergraduate enrollments to the national average by the year 2020. According to a study by RAND, this would require the state's public institutions of higher education to increase undergraduate enrollment by 80,000 students.[16]

The goal of enrollment and other reforms is to improve the quality of life in the Commonwealth. Both the rhetoric supporting passage of the bill and the language of the bill itself, which contains repeated references to a better quality of life for all Kentuckians, reflect a broad commitment to the greater purpose of higher education, that of improving the well-being of all citizens of the state.

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[12] The state level indicator was obtained from Patrick Kelly of the Kentucky Council on Postsecondary Education on May 1, 2001. The national level indicator was taken from *The Condition of Education, 2000* by the National Center for Education Statistics. Both statistics refer to high school students attending all postsecondary institutions the fall following graduation in 2000.

[13] Council on Postsecondary Education, *Developing Key Indicators of Progress* (draft).

[14] *1999 Status Report to the Governor and the General Assembly*.

[15] *1999Status Report*.

[16] George Graves, "More Undergraduates Wanted—Lots More," *Foresight* 7.1 (2000): 5.

In response to this immense challenge, the Council was charged with creating a strategic agenda for achieving the reforms intended by the Act. Nowhere are the social benefits of education at the postsecondary level better illustrated than in this document's section entitled "The Vision." Authors of the legislation ask citizens of Kentucky to envision several criteria for how the state will be recognized by others. They include:

1) educated citizens who want advanced knowledge and skills and know how to acquire them; and who are good parents, good citizens and economically self-sufficient workers;
2) globally competitive businesses and industries respected for their highly knowledgeable workers and the technological sophistication of their products and services;
3) vibrant communities offering a standard of living unsurpassed by those in other states and nations;
4) scholars and practitioners who are among the best in the world, dedicated to creating new ideas, technologies and knowledge; and
5) an integrated system of elementary and secondary schools and providers of postsecondary education, committed to meeting the needs of students and the Commonwealth, and acclaimed for excellence, innovation, collaboration, and responsiveness.[17]

The one direct and most obvious criterion, a better all-around school system, is listed last. By contrast, the first four criteria represent some of the social benefits of a higher education system, which promise a better life to all, including good parents, vibrant communities, and globally competitive businesses. Here, we focus on ways of measuring some of these outcomes from an improved postsecondary educational status.

[17] *2020 Vision: An Agenda for Kentucky's System of Postsecondary Education.*

Social Benefits of Going to College

If at the end of [Kentucky's 20-year commitment to reforming postsecondary education] what we've done is build institutions of higher learning, but 25 percent of Kentucky's children still live in poverty and a million people still are challenged as to reading and writing, if at the end of 20 years we haven't changed the conditions within which women, men and their children live in this state, we shall have failed.

—Gordon Davies
President
Kentucky Council on Postsecondary Education

The slogan "Education Pays" resonates with many since the monetary rewards associated with higher levels of education are generally well-known. What is perhaps less well-known, but no less important, are the rewards that accrue to all of society as a state's overall education level rises. These benefits include, but are not limited to, decreased reliance on public assistance, increased tax revenues, lower demands on the criminal justice system, greater civic participation, better health status through improved lifestyle choices, improved parenting skills, increased entrepreneurial activity, and increased access to and use of computers and the Internet.[18] After a brief discussion of the traditional measure of benefits associated with more schooling—earnings this section focuses on some social benefits associated with educational attainment beyond the secondary level. Or, more precisely, we focus on social benefits of education we might expect as more Kentuckians move from a high school diploma to a four-year college degree or higher.

Earnings

Research confirms what common sense suggests: higher education generally leads to higher earnings. Formal acknowledgement of the close relationship between

[18] For the purposes of this report, "social benefits of education" will refer to these "less well-known" benefits. For more information on this definition, see the Glossary.

education and income occurred in the early 1960s in the work of Schultz, Becker and Mincer.[19] Becker defined investments in human capital as those that increase an individual's skills and competencies. Education was identified as a type of investment in human capital from which positive returns are expected. Since the book's publication, the relationship between earnings and education has been studied extensively. In a meta-analysis of 43 studies of this type, Leslie and Brinkman estimate the mean rate of return to completing an undergraduate education at approximately 12.4 percent.[20] This estimate is typical of most studies and represents the returns to higher education in the form of higher earnings. Studies acknowledging the wider array of higher education's benefits claim that these estimates considerably underestimate the true returns and that the actual rate is quite possibly twice the standard estimate.[21]

A 1993 study by Berger and Black of the University of Kentucky's Center for Business and Economic Research observes, "The most enduring economic impact of the universities is the increased earning power that students take with them into the job market."[22] The study shows that the effect continues throughout a student's adult life and also aids in economic development by providing new businesses with a skilled labor force. Berger and Black use a variation of Mincer's earning function and Kentucky-specific data to estimate the long-run, income-related returns from Kentucky's higher education system. Their analysis adjusts estimates to account for mitigating factors such as migratory patterns, type of degree earned, life expectancy differences between men and women, and productivity growth, to provide a more accurate overview of postsecondary education's returns to Kentucky.[23]

Similar to national-level studies, the results of this state-level analysis reveal substantial increases in earnings for increasingly higher levels of education. Figure 2 shows the increase in earnings for Kentucky men and women at higher levels of postsecondary educational attainment compared with high school graduation.[24] This figure shows that a Kentucky man with a bachelor's degree will earn, on average over his lifetime, approximately $357,000 more than a high school-educated Kentucky man. Women graduates from four-year institutions in

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[19] Schultz, Mincer, Becker.

[20] Leslie and Brinkman 47. A meta-analysis is a study of studies. The reported value is the mean of the 43 different rates of return estimates in each of the studies included in their analysis.

[21] R.H. Haveman and B. L. Wolf, "Schooling and Economic Well-Being: The Role of Nonmarket Effects," *Journal of Human Resources*, 19.3 (1984): 377-407; Becker (1975): 117-120.

[22] Mark C. Berger and Dan A. Black, "The Long-Run Economic Impact of Kentucky Public Institutions of Higher Education," Department of Economics, University of Kentucky, Lexington, KY, 1993.

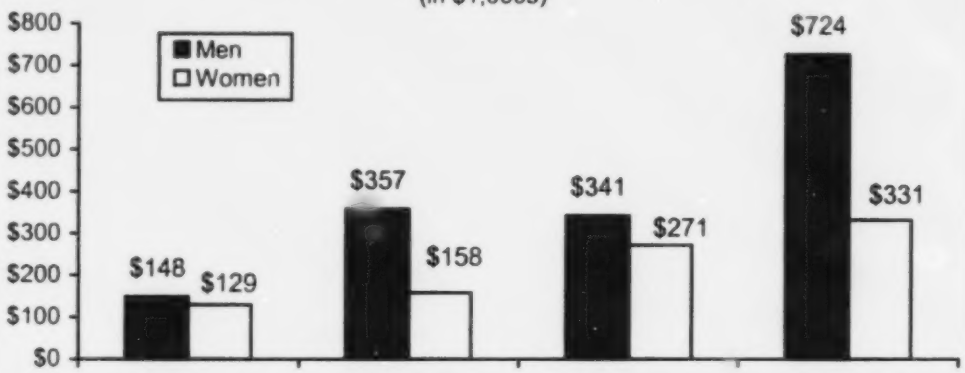
[23] For more information on data and methodology, see Berger and Black, 1993.

[24] The authors attribute the wide discrepancy in earnings between men and women to "lower probabilities of working at given age levels and lower earnings if they do work" and "occupational choices and wage differences within given occupations." While the results indicate men with a master's degree earn less than men with a baccalaureate degree, they attribute this in part to a field-of-study effect. Individuals may be more likely to get a master's degree in relatively low-paying fields such as education and liberal arts.

Kentucky can expect to earn over their lifetimes approximately $158,000 more than their high school counterparts.[25]

These results help illustrate how an *individual* may benefit privately from more schooling through an associated increase in earnings. Recent studies have identified other avenues through which education may benefit an individual and the society in which he or she lives.[26] The remainder of this section explores a select few of these effects for the Commonwealth, known here as the "social benefits of education."

FIGURE 2
Present Value of Lifetime Earnings Compared to High School, by Degree and Gender, Kentucky, 1993
(in $1,000s)



Source: Mark Berger and Dan Black, UK Department of Economics
Note: All values inflation-adjusted to 2000 dollars using the CPI-U

INCOME TAXES

Given the state's substantial financial investment in postsecondary education, it seems only natural to ask what the state's taxpayers receive in direct return for their investment. Two recent studies focus on a wide array of public assistance programs and taxes affected by education at the national level.[27] The models used in these analyses estimate the relationship between education and the use of public assistance programs. The results associate decreased reliance on public assistance

[25] These figures represent present values discounted at a rate of 3.05 percent.

[26] Behrman and Stacey, eds.; Barbara Wolfe and Samuel Zuvekas, "Nonmarket Outcomes of Schooling," *International Journal of Educational Research*, 27.6 (1997): 491-501; Walter W. McMahon, "Conceptual Framework for the Analysis of the Social Benefits of Lifelong Learning," *Education Economics* 6.3 (1998): 309-346.

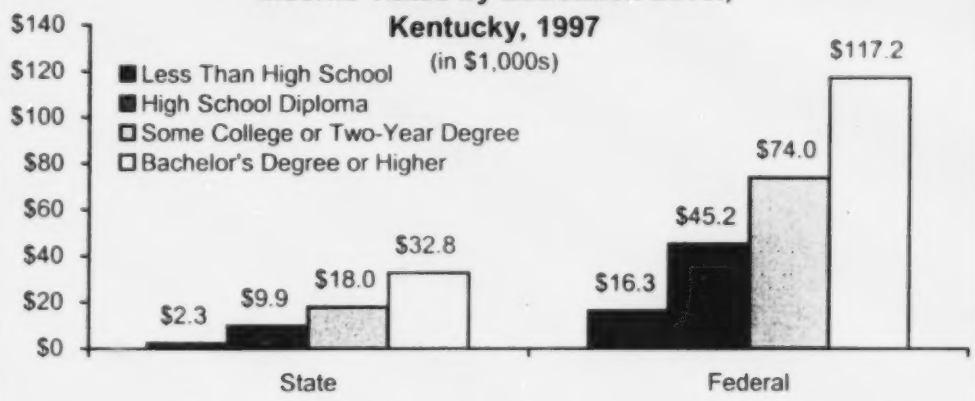
[27] Richard A. Krop, *The Social Returns to Increased Investment in Education: Measuring the Effect of Education on the Cost of Social Programs*, (Santa Monica, CA: RAND Graduate School, 1998); Georges Vernez, Richard A. Krop and C. Peter Rydell, *Closing the Education Gap: Benefits and Costs*, (Santa Monica, CA: RAND, 1999).

programs and more tax revenue with more schooling, including the attainment of a bachelor's degree or higher.

A substantial increase in income tax payments is seen over a person's lifetime as a result of increasing educational attainment from a high school diploma to a bachelor's degree or higher. Income and tax data were used in a regression analysis to estimate the relationship between education and tax payments in Kentucky.[28] This increase occurs for both federal and state taxes. Figure 3 shows the present value of expected lifetime federal and state tax payments by education level for the typical Kentuckian, regardless of gender.

State government alone could expect an increase in income tax revenue of approximately $22,947 over the lifetime of an individual with at least a bachelor's degree compared with a high school graduate. And the increase in federal income tax revenue associated with this educational increase is over three times the amount gained at the state level.[29] As tax revenues increase, the quality of government services will also likely increase. Thus, benefits accrue to society in the form of access to improved government services.

FIGURE 3
Present Value of Expected Lifetime State and Federal Income Taxes by Education Level, Kentucky, 1997
(in $1,000s)



Source: Kentucky Long-Term Policy Research Center Analysis of Current Population Survey Data and Internal Revenue Service InformationServices
Note: All values adjusted for inflation to 2000 dollars using the CPI-U

[28] For more information on data and methodology, see Appendix B.

[29] Per capita federal spending in Kentucky was $6,111 in fiscal year 1999, compared with per capita federal taxes from Kentucky of $4,516 for the same year. This resulted in a per capita surplus of $1,595 in the state's balance of payments. Therefore, all of Kentucky's federal income tax payments were included in the final cost-benefit analysis following this section. For more information on these estimates, refer to Herman B. Leonard and Jay H. Walder, *The Federal Budget and the States: Fiscal Year 1999* (Taubman Center for State and Local Government, John F. Kennedy School of Government, Harvard University: 2000).

PUBLIC PROGRAM PARTICIPATION

We also find an associated decrease in reliance on public assistance programs as education level rises, thus improving the capacity of the public sector to serve. As participation in these programs declines with an increase in education, public resources are freed that can be returned to the taxpayer or used in other areas that contribute to the public good. A variety of programs combine federal and state funds to provide public support for the needy. They include programs such as Temporary Aid to Needy Families (TANF), food stamps, free and reduced school lunch programs, housing subsidies, and many more. Here we examine the relationship between educational attainment and two widely known public assistance programs, welfare and food stamps.

Kentucky's principal public assistance or welfare program is the Transitional Assistance Program or K-TAP. The proportion of Kentuckians served by this program is relatively small, representing less than 1 percent of the state's total population, with approximately 34,200 cases in 2000. The average monthly grant per case is about $249. The number of recipients of food stamps in Kentucky is larger, at around 167,311, with an average monthly benefit of $168 per recipient.[30]

The combined expected annual K-TAP and food stamp savings to Kentucky by increasing education from a high school diploma to a bachelor's degree or higher is approximately $1,736 for a woman and $1,586 for a man (see Figure 4). These results show the expected value of participation in both programs by education level for men and women age 30.[31] Expected values take into account the probability that a person uses the program based on a regression analysis controlling for age, gender, education, race or ethnicity and the location of residence. The average monthly payment is constant for all persons; therefore, the variation in expected annual payments is due solely to the differences in the probability of participation. Women are more likely to participate in these programs, and this appears in the relatively lower expected yearly benefits received by men.

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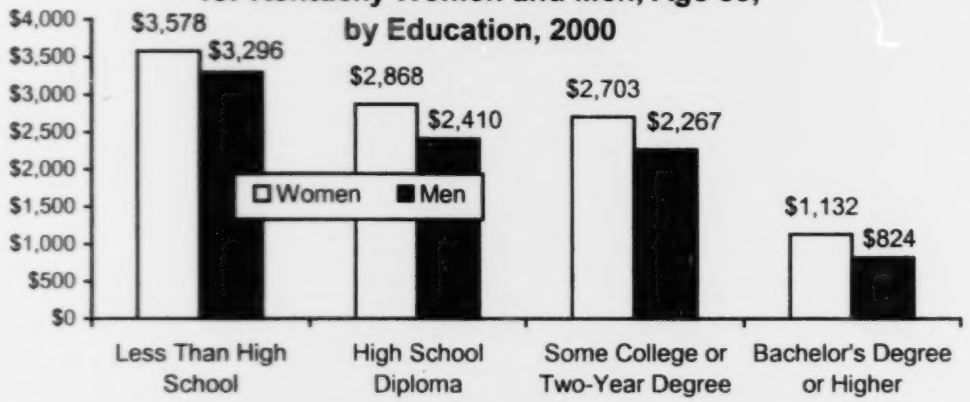
[30] Kentucky Cabinet for Families and Children, Commonwealth of Kentucky, "Statewide Summary," June 2000.

[31] This is the average age of a typical welfare recipient in Kentucky, according to William Hoyt, "Welfare Reform in Kentucky: Has 'Welfare as We Know It' Changed?" *1997 Kentucky Annual Economic Report*, (Lexington, KY: The University of Kentucky Center for Business and Economic Research, 1997).

FIGURE 4
Expected Annual Welfare and Food Stamp Benefits for Kentucky Women and Men, Age 30, by Education, 2000



Source: University of Kentucky Survey Research Center and Kentucky Cabinet for Families and Children

Theoretically, public financial support programs such as welfare and food stamps provide *temporary* "safety nets" to those in need. The goal is to reduce the number of persons who rely on these types of programs and enable them to become self-sufficient. These results indicate that higher education serves as a potential corridor to decreasing reliance on public financial assistance. Moreover, the decrease in expected annual payments is considerably greater for the move from a high school graduate to a graduate of a four-year college compared with some college experience or a two-year degree.

THE CRIMINAL JUSTICE SYSTEM

Crime imposes a variety of costs on society. These costs can be seen directly through the public sector's expenditures on prisons, and indirectly through the cost of private deterrence. Many of these costs are difficult to quantify, but one study estimates the national cost of crime to exceed $1 trillion.[32]

Approximately 15,200 adults were in state correctional facilities in Kentucky in 2000, at an average annual cost of $19,820 per prisoner. Any savings in this hefty annual price tag of approximately $301 million to the Commonwealth would be desirable.[33] Evidence shows a significant negative relationship between crime rates and education: the more educated a populace, the lower its crime rate.[34] Less

[32] David A. Anderson, "The Aggregate Burden of Crime," *Journal of Law and Economics*, XLII.2 (1999): 611-642.
[33] Kentucky Department of Corrections, *Current Extract File*, December 2000.
[34] Ann Dryden Witte, "Crime" in *Social Benefits of Higher Education*, Jere Behrman and Nevzer Stacey, eds.: 219-245.

criminal activity leads to lower demands on the criminal justice system, including public funds spent on prosecution, punishment and probation. However, a possible drawback is as the population becomes more educated, crimes could become more sophisticated, such as computer hacking. These types of crimes are generally more expensive than petty theft or other similar crimes conducted on a smaller scale. While the criminal justice system is comprised of many sectors, we analyze only one sector of the criminal justice system in Kentucky—prisoners of state correctional facilities. The decline in expected costs of incarceration associated with increases in educational attainment are used to estimate the possible societal gains attributed to crime reduction.

The expected cost of imprisonment for a typical Kentuckian is equal to the average per-person cost of the criminal justice system times the likelihood of incarceration based on gender, age and educational attainment level.[35] Analytical results reveal a relatively youthful incarcerated population, as expected costs decline with age. There is also a considerable difference between the expected annual costs of the two genders. The maximum expected annual costs range from $1,401 for a 27-year-old male to $84 for a 26-year-old female, both with less than a high school diploma.[36] These results are similar to other studies that find a higher propensity of men to engage in felonious criminal activity than women.

Figure 5 shows that the bulk of savings associated with increased education occurs for the educational increase from a high school dropout to a high school graduate. Nonetheless, Figure 5 also shows that over the lifetime of a typical Kentucky man, considerable gains of approximately $2,367 are still to be expected by increasing educational attainment from a high school diploma to a four-year degree. The Kentucky Department of Corrections projects the inmate population to increase to about 19,000 persons by 2006, attributable mostly to an increase in the number of male prisoners. In aggregate, the potential savings to our criminal justice system associated with higher levels of education could add up quickly, given this projection.[37]

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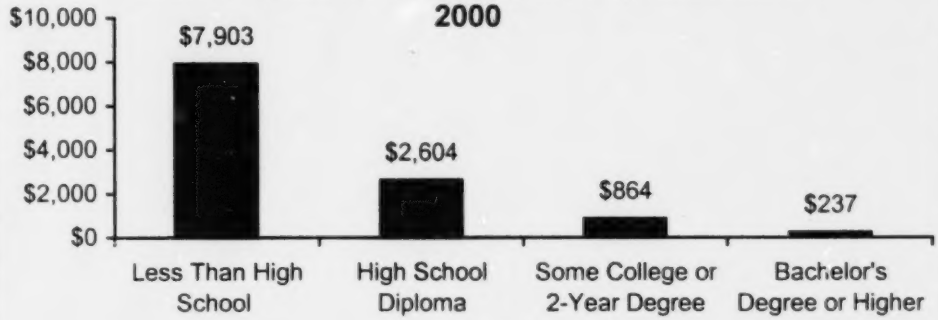
[35] The average cost per person is constant, regardless of age, sex or education level. Therefore, the variation in expected costs depends solely on the variation in the likelihood of incarceration given these demographic characteristics. See Appendix C for more details on data and methodology.

[36] The exceptionally low value for women is due to the relatively low probability that a woman will be incarcerated in a state prison. This yearly estimate is an expected value of the yearly cost of incarceration which is approximately $19,820 on average multiplied by the probability that a 26-year-old female will be incarcerated. This likelihood is approximately 0.43 percent—less than half of 1 percent.

[37] Kentucky Department of Corrections (KDC), data accessed online at their website: <www.cor.state.ky.us/corrections_slideshow.htm> on February 22, 2001. Projections are based on the results of a statistical simulation model called "Prophet," developed in 1982 by the National Council on Crime and Delinquency and adopted by the KDC in 1992.

FIGURE 5
Present Value of Expected Lifetime Criminal Justice Costs for Kentucky Men by Education, 2000



Source: Kentucky Long-Term Policy Center Analysis of Current Population Survey, U.S. Department of Justice, and Kentucky Department of Corrections data

CIVIL SOCIETY

Higher education may have a positive effect in yet another area—that of civil society. Robert Putnam, a noted researcher in the study of civil society, asserts that "dozens of studies [confirm] that education [is] by far the single best predictor of engagement in civil life."[38] Civil society has been referred to as a third sector of society in that it has neither political nor private commercial associations.[39] Civil society encompasses those facets of community involvement and organization that help strengthen social cohesion. As opposed to "social capital," which refers to *attitudes* people have towards one another and their communities, civil society refers to the *actions* taken in expression of those attitudes.

This report is concerned with the ways in which such actions as voluntarism, charitable giving, and community organization and leadership are influenced by more education. In particular, an increase in schooling from the secondary level to the postsecondary four-year degree level is associated with a hypothesized rise in participation in these areas. These results are particularly timely, given a recent report identifying a national downward trend in voluntarism. While the situation has not reached crisis status yet, the report claims that charities are finding it more difficult to recruit volunteers than just a few years ago.[40]

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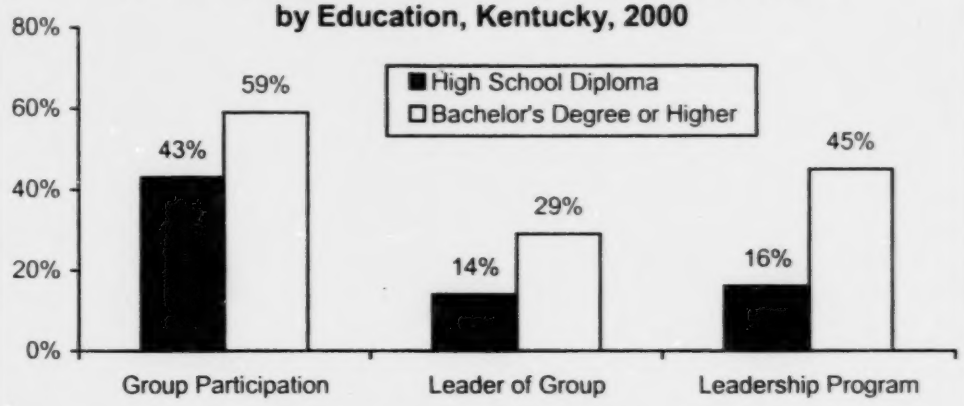
[38] Robert Putnam, *Bowling Alone*, p. 18.
[39] Peter Schirmer, Ryan Atkinson, Jeff Carroll and Michal Smith-Mello, *Civil Society in Kentucky* (Frankfort: Kentucky Long-Term Policy Research Center, 1998).
[40] Peter Smith, "Volunteers scarce, some charities find," *Courier-Journal*, 5 Nov. 2000.

FIGURE 6
Predicted Probabilities of Civil Society Participation by Education, Kentucky, 2000



Source: Kentucky Long-Term Policy Research Center and the University of Kentucky Survey Research Center

The Kentucky Long-Term Policy Research Center (KLTPRC) has been tracking the health of civil society in Kentucky for several years. Each year the Center asks questions regarding community involvement and leadership activities via the semiannual Kentucky survey which is conducted by the University of Kentucky Survey Research Center (UKSRC). We estimate the relationship between education and the probability a person has ever participated in a group to solve a problem in his or her community, was the leader of that group, or participated in a leadership development program.

Our results indicate that college-educated persons have a higher propensity for participating in community organizations and for taking a leadership role in those activities (see Figure 6).[41] The effect of higher education on leadership is particularly strong. The probability of being the leader of a community group or participating in a leadership program more than doubles in both cases as education increases from the level of a high school diploma to that of a four-year postsecondary degree or higher.

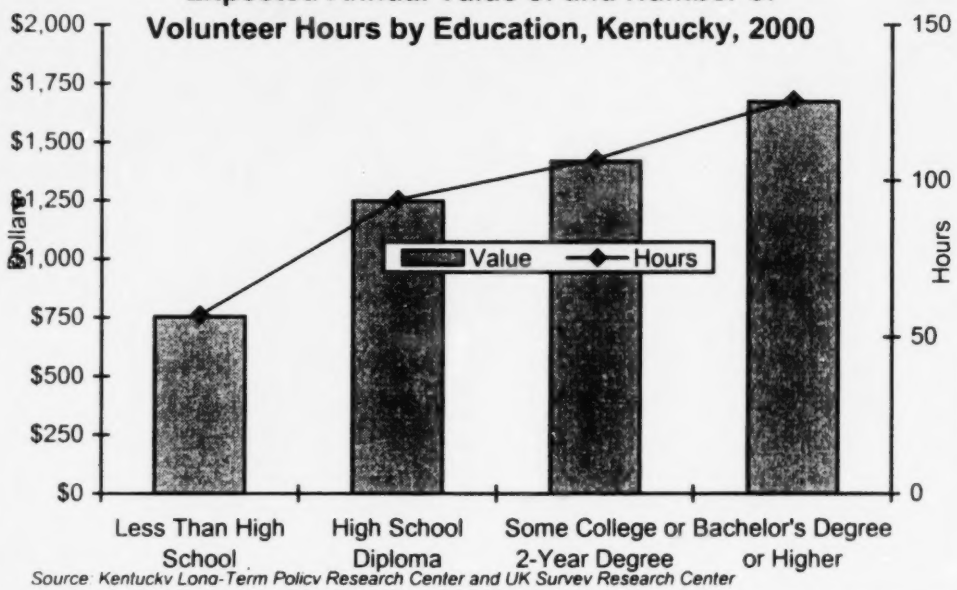
The Center also asks respondents about their charitable giving and volunteer activities. When asked if a donation to a charitable or nonprofit organization had been made in the last year, the percentage of respondents answering "yes" increased from 85 percent for high school graduates to approximately 93 percent for those with a bachelor's degree or higher. These estimates reflect the association between education and charitable giving while controlling for income, age, gender, race and whether the person lives in a rural or urban area.[42]

Using these same data, we also find a relationship between education and the number of hours volunteered in a month. Figure 7 presents the results of a two-

[41] For more information on data and methodology see Appendix A.
[42] See Appendix A.

part model estimating expected volunteer hours, which is comprised of both the probability of volunteering and the length of time spent volunteering.[43] The model predicts an increase in the number of hours volunteered as the average Kentuckian increases schooling from a high-school diploma to a four-year degree or higher, while controlling for other important factors. Using the average wage for Kentucky, this increase is valued at approximately $425 annually for the average Kentuckian.[44] The present value of expected annual volunteer hours over the lifetime of a woman with a bachelor's degree or higher is approximately $41,280 and $39,435 for a man.

FIGURE 7
Expected Annual Value of and Number of Volunteer Hours by Education, Kentucky, 2000



Source: Kentucky Long-Term Policy Research Center and UK Survey Research Center

Another closely related aspect of civil society is political participation, the cornerstone of a well-functioning democracy. While our forefathers may have endowed our democratic society with the right to vote and choose our leaders, exercise of this liberty has waned in recent years. This apathy is evidenced by low voter turnout. Turnout of the voting-age population to presidential elections has hovered around 50 percent since 1968, when a 61 percent turnout was recorded. Even with seemingly record numbers of voters flocking to the polls in the 2000

[43] See Appendix A.

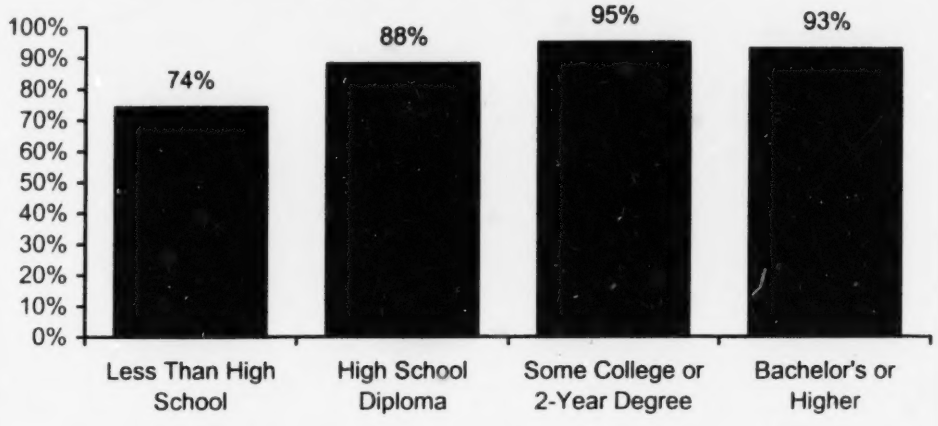
[44] The average wage is estimated to be $13.24 per hour in 2000 dollars. This was estimated as a weighted average of hourly wages by industry sector using data in the "1999 State Occupational Wage and Employment Estimates" from the Bureau of Labor Statistics and adjusted to 2000 values using the Consumer Price Index.

presidential elections, the actual proportion of the nation's voting-age population that voted was still just 51 percent.[45]

Evidence has shown that as persons become more educated, especially at the postsecondary level, their interest and participation in political matters increases. Thomas Jefferson once noted that "readily available education" is an essential part of a democratic society. Voters must be educated to make informed decisions regarding the choice of their leaders. Education possibly has a dual role in sustaining democracy. On the one hand, it is an essential element in empowering voters to make wise decisions. On the other hand, it may also serve to remedy declining participation rates.

On all of its semiannual Kentucky surveys, the UKSRC asks respondents if they are registered to vote.[46] The number of persons replying "yes" to this question was relatively high on the fall 2000 survey. Of the 758 respondents, 589 or 78 percent answered that they were registered to vote. While this is a substantial proportion of the respondents, education remained a significant predictor of voter registration. Figure 8 presents the results of a regression model estimating the relationship between educational status and probability of voter registration. Education at all levels significantly increases the probability that a person will be registered to vote. Interestingly, this effect diminishes somewhat at the bachelor's degree or higher level, however only slightly.

FIGURE 8
Probability of Being Registered to Vote by Education, Kentucky, 2000



Source Kentucky Long-Term Policy Research Center and the University of Kentucky Survey Research Center

[45] Federal Election Commission. Data drawn from Congressional Research Service reports, Election Data Services Inc., and State Election Offices.

[46] For more information on data and methodology, see Appendix A.

SMOKING

Tobacco use is the second leading cause of death in the United States and the number one *preventable* cause of death. The leading causes of smoking-related deaths are lung cancer and ischemic heart disease. Lost productivity and the health care costs of treating the array of illnesses linked to smoking are just two of the ways that smoking can impose economic costs on society.

The potential cost burden of smoking, data suggest, is particularly high for Kentucky. After holding the number one rank for the highest percentage of adult smokers in the nation since 1995, Kentucky fell to number two behind Nevada in 1999.[47] However, the percentage of adults in Kentucky who smoke was still 29.7 percent, or almost a third of the adult population.[48] While it is promising that we are reducing our adult population of smokers, Kentucky has remained number one in youth smoking, a reliable predictor of adult smoking rates.

These two factors—relatively high smoking rates and the resultant poor public health—can severely strain Kentucky's health care resources and impose high costs to its economy and population in general. In 1993, the estimated smoking-attributable expenditures on health in Kentucky were $1 billion annually.[49] A large proportion of these expenditures came from public sources, with the tax burden of smoking estimated to be approximately $520 million annually and Medicaid expenditures attributable to smoking estimated at approximately $200 million annually.[50]

The College of Nursing at the University of Kentucky asked Kentucky residents about their smoking habits in the UKSRC Kentucky Spring 2000 Survey.[51] More specifically, they asked survey respondents "Have you smoked in the last 30 days?" Figure 9 presents the sample estimates and model predictions of the probability of answering "yes" by educational attainment level. Controlling for other factors associated with the decision to smoke, such as gender, age, income, location of residence in a rural or urban area, race or ethnicity, educational attainment remains significantly related to the probability of smoking. An increase from a high school education only to a bachelor's degree or higher reduced the probability of whether sample participants had smoked in the last 30 days from about 34 percent to about 20 percent. As this probability declines for more people, so too will smoking-related health problems and the accompanying costs of their treatment. Productivity losses will also decline with reductions in smoking, as fewer

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[47] Monica Richardson, "Bet You Didn't Know Nevada's Smokers Now Lead Ky." *Lexington Herald-Leader*, 18.305 (2000): A1.

[48] Richardson.

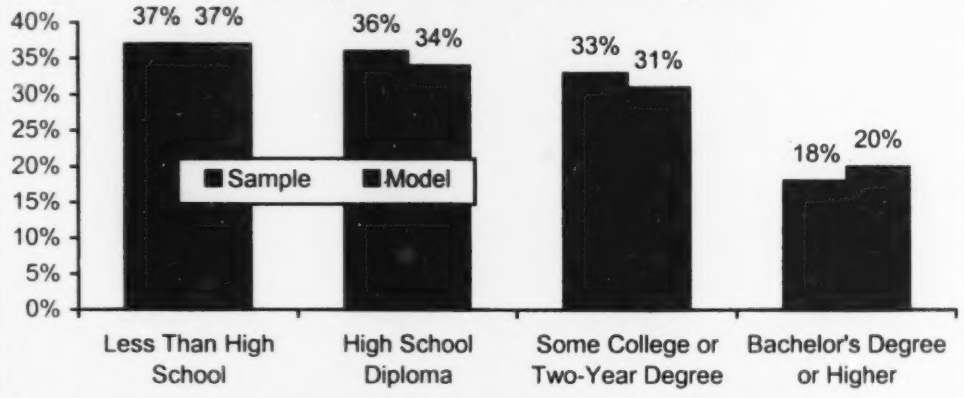
[49] Leonard S. Miller, Xiulan Zhang, Dorothy P. Rice, and Wendy Max, "State Estimates of Total Medical Expenditures Attributable to Cigarette Smoking, 1993," *Public Health Reports*, 113 (1998): 447-458.

[50] Miller et al.

[51] For more information on data and methodology, see Appendix A.

people experience smoking-related health problems, and businesses absorb fewer related costs for health care, lost workdays, and other associated costs.[52]

FIGURE 9
Sample and Model Estimates of the Probability of Smoking by Education, Kentucky, 2000



Source: Kentucky Long-Term Policy Research Center, University of Kentucky College of Nursing, and the University of Kentucky Survey Research Center

"OTHER" BENEFITS

While the purpose of this report is to *value* the social benefits of education, many outcomes associated with higher levels of education are difficult to value monetarily. Although explicit market values do not exist for these education-related outcomes, society's members may still value them. This section looks at some of the ways increasingly higher educational attainment levels lead to better family outcomes, higher levels of entrepreneurial activity, and greater access to and use of technology. In turn, each of these outcomes has enduring and widespread benefits.

READING TO CHILDREN

The Council on Postsecondary Education in Kentucky envisions good parents as one of the associated outcomes of improved educational status. One of the ways parents can enrich their children's lives is by reading to them regularly. Research has shown that reading to children is the most important thing a parent can do to prepare a child for future academic success.[53] For example, one study found that

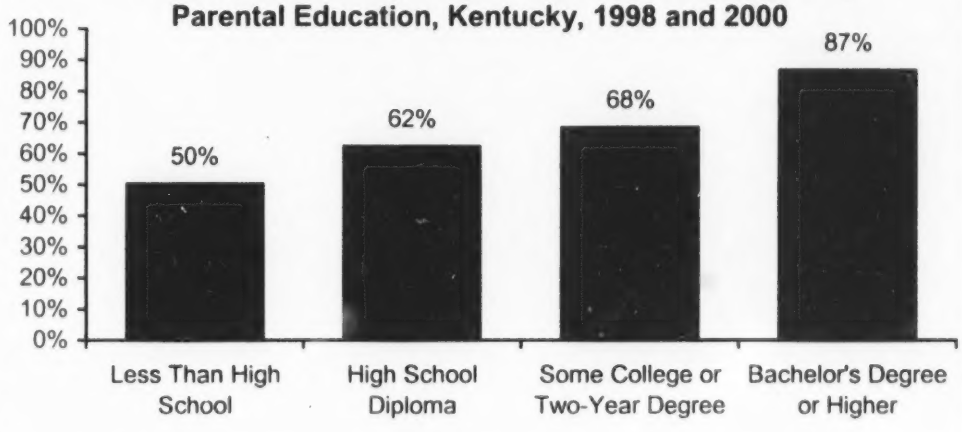
[52] However, as health improves and people begin to live longer, costs associated with the elderly may increase overall. This is one of the "downfalls" of improved population health that researchers have begun to acknowledge in recent years.

[53] Veda Pendleton-McClain and Steven A. Stahl, "Standing in the Gap: Parents Reading with Children," Paper presented at the annual meeting of the National Reading Conference (New Orleans, LA: November 29-December 2, 1995); Jo Weinberger, "A Longitudinal Study of Children's Early Literacy

those children who were read to once a day or more at the age of two or three performed much better in kindergarten at the ages of four and five than those who had been read to only a few times a week or less. Children who were read to on a daily basis or more were 1.6 times and 2.3 times more likely to be rated at the top of their class in learning and communication skills, respectively, than those who were not.[54]

The Kentucky Long-Term Policy Research Center asked parents on the UKSRC Kentucky spring polls of 1998 and 2000 how often they read to their children, age eight years and younger.[55] Using pooled data from these two surveys, probit regression analysis was used to investigate the effect of parents' education on the likelihood and frequency of reading to their young children. Our models did not find a significant relationship between parents' schooling and the likelihood of reading to their children, since the majority of parents with children under eight years of age said they read to their children. Only 18 persons out of 379 responded that they did not read to their young children. However, higher education has a significant and substantial effect on the frequency of reading to children. Figure 10 presents the probit model results of the relationship between parental education and the probability of reading every day to one's young children. The predicted probability of reading to one's children on a daily basis jumps from 62 percent at the high school-only level to 87 percent for those with a four-year degree or higher.

FIGURE 10
Probability of Reading Daily to Children Under Age 8 by Parental Education, Kentucky, 1998 and 2000



Source: Kentucky Long-Term Policy Research Center and the University of Kentucky Survey Research Center

Experiences at Home and Later Literacy Development at Home and School," *Journal of Research in Reading*, 19.1 (1996): 14-24.

[54] "From Home to School: How Canadian Children Cope," Oct. 1999, 12 March 2001, <www.ladderstolearning.com/resource.htm>.

[55] For a more detailed description of the data, methodology and parameter estimates, see Appendix A.

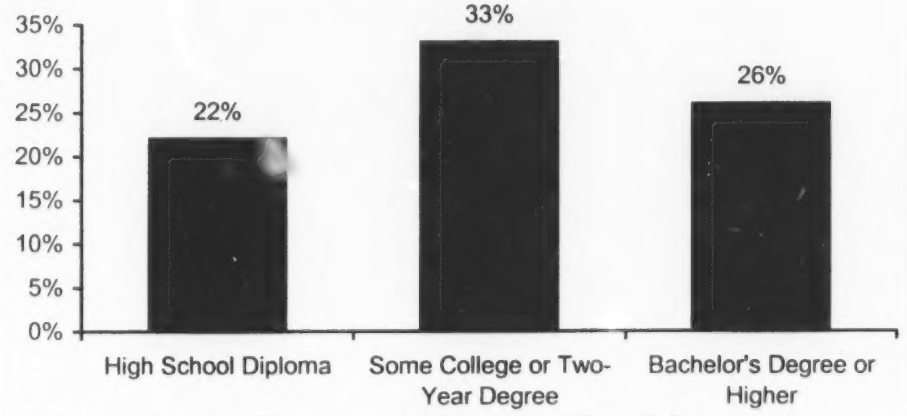
ENTREPRENEURISM

Policies encouraging entrepreneurial activity benefit the Commonwealth in a variety of ways. Research shows, for example, that entrepreneurial development holds the possibility of many short- and long-term benefits, including high-value jobs, greater equity in job opportunities, innovation, diversity of an economic base, wealth generation, and radiating economic and social entrepreneurship.[56]

Our results show that increases in education are associated with increases in entrepreneurial activity (see Figure 11). In the spring of 2000, the Center asked a sample of Kentuckians responding to the UKSRC semiannual poll if they had ever started a business. A probit model was used to estimate the relationship between education and the probability of starting a business.[57] While the probability increases with postsecondary educational attainment, this effect diminishes at the baccalaureate level.

This finding is interesting in that it underscores the importance of education past the high school level, even in the form of some college experience, a two-year, or a technical degree. The potential lack of choices in the job market for those with lower levels of education—especially in depressed economic times—could be a possible explanation for this result. Those with fewer career choices may be forced to tap into their latent entrepreneurial skills as a means of procuring employment.

FIGURE 11
Probability of Starting a Business by Education, Kentucky, 2000



Source: Kentucky Long-Term Policy Research Center and UK Survey Research Center

[56] Michael T. Childress, Michal Smith-Mello, and Peter Schirmer, *Entrepreneurs and Small Business—Kentucky's Neglected Natural Resource* (Frankfort, KY: The Kentucky Long-Term Policy Research Center, 1998).

[57] For more details on data, methodology and the parameter estimates, see Appendix A.

TECHNOLOGY

Research shows that because information technology permeates so many aspects of our lives, access to and use of it appear to be increasingly important for becoming politically informed, socially integrated, and economically successful in the Information Age. We know, for example, that individuals who use computers are better informed about political, community, and social issues than those who do not use computer-based communications.[58] Research has also shown that the emergence of electronic networks, such as the Internet, facilitates the crumbling of "status-based social structures" and thus benefits the politically or economically disadvantaged.[59] Moreover, ample evidence suggests that access to computers and information networks has broad economic benefits for workers. Our estimates indicate that workers in businesses who use computers earn 10 percent to 20 percent more than workers in comparable businesses who do not.[60]

Clearly, access to and use of information technology are vitally important. Indeed, RAND researchers suggest, "there [are] reasons to view economic and social stratification of computer and network use differently from the socioeconomic stratification that characterizes the consumption of other goods and services."[61] Because those who use the technology are, by definition, better informed, "different levels of access to computer-based communication technology, then, may further stratify individuals and create information have-nots alongside the information elite."[62] And this stratification is likely to become more problematic as public and private institutions increasingly disseminate information electronically.

Access to computers and the Internet, the very tools that promise to be "the greatest equalizers our society has ever known,"[63] skew along the lines of education. Figure 12 presents the results of a model estimating the probability of computer access and Internet use. It shows the likelihood of embracing the tools of the Information Age increases as educational attainment increases from high school to a bachelor's degree.[64]

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[58] Robert H. Anderson, Tora K. Bikson, Sally Ann Law, and Bridger M. Mitchell, *Universal Access to E-Mail: Feasibility and Societal Implications* (Santa Monica: RAND, 1995) 14.

[59] Anderson, Bikson, Law, and Mitchell 17.

[60] Childress, Smith-Mello, and Schirmer 62.

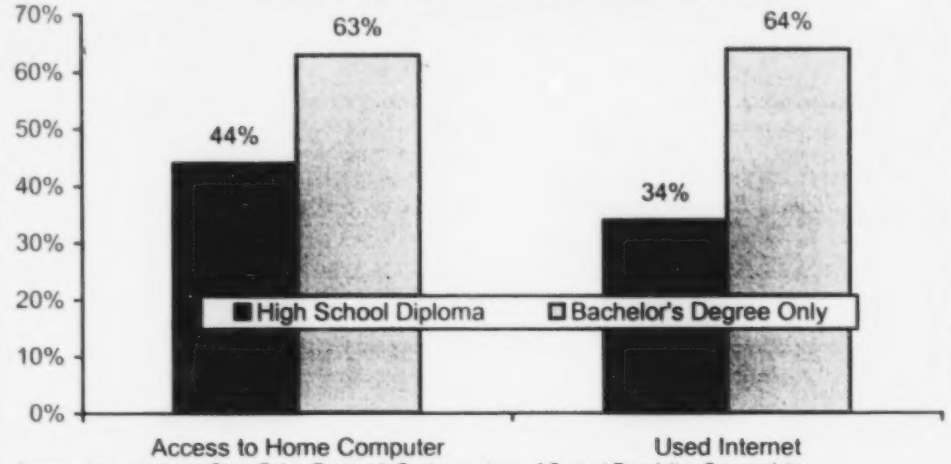
[61] Anderson, Bikson, Law, and Mitchell 15.

[62] Anderson, Bikson, Law, and Mitchell.

[63] Michal Smith-Mello, Michael Childress, Amy Watts, and John Watkins, *Challenges for the New Century* (Frankfort, KY: Kentucky Long-Term Policy Research Center, 2000).

[64] In keeping with other published research by the Kentucky Long-Term Policy Research Center on the digital divide, this measures the effect of a bachelor's degree only. Higher degrees are not included in this category for this model. For more information on the data and methodology used in the creation of this graph see the Appendices of *Challenges for the New Century*.

FIGURE 12
Probability of Access to Home Computer and Internet Use by Education, Kentucky, 1998



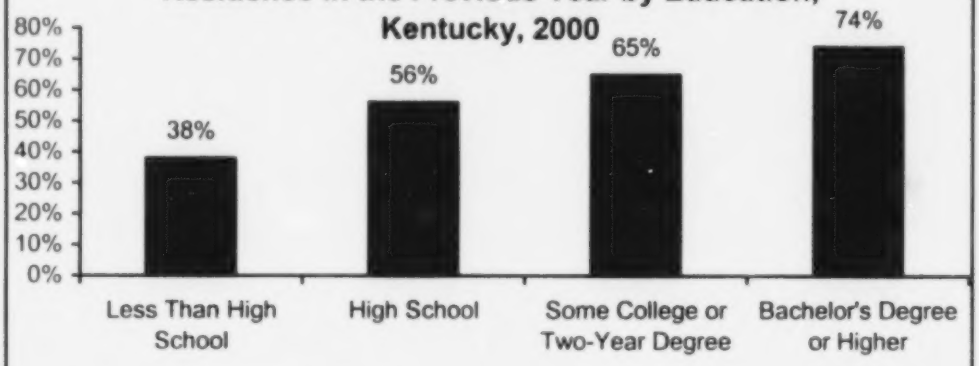
Source: Kentucky Long-Term Policy Research Center analysis of Current Population Survey data

CULTURAL OPPORTUNITIES

Art, as those who aspire to it and who are inspired by it will attest, ennobles us. It elevates our spirits, expands our compassion and enriches our lives. Moreover, some research suggests that art and music may aid the learning process. Thus, the opportunity for exposure to and participation in the arts and humanities enables learning and development and enriches society.

We find a significant and consistent rise in cultural activity as education increases—for all levels. The Center asked Kentuckians in the fall of 2000 whether they had visited a museum, festival, arts performance, or historical site in their county in the previous year. Figure 13 shows the results of the model analyzing the relationship between education and the likelihood of answering "yes" to this question. The probability that a person was culturally active within their own county in the past year increases from just over half to approximately 74 percent as education increases from the high school level to a bachelor's degree or higher. This effect is consistent for all levels of education—including some college education or a two-year postsecondary degree.

FIGURE 13
Probability of Visiting a Museum, Festival, Arts Performance or Historical Site in County of Residence in the Previous Year by Education, Kentucky, 2000



Source: Kentucky Long-Term Policy Research Center and the University of Kentucky Survey Research Center

CONCLUSIONS

These results provide only a glimpse of some of the many potential benefits that result from increasing the education of Kentucky citizens.[65] Nevertheless, they do suggest that the benefits are far-reaching and substantial. In the next section we examine the "cost" of going to college in order to compare it with these estimated benefits.

[65] An array of other benefits in the areas of health and criminal justice were not examined in this report. In addition, environmental awareness and attitudes toward preservation have also been shown to increase with more schooling. For examples of these and other social benefits of education not included in this analysis see: Jere R. Behrman and Nevzer Stacey, eds., *The Social Benefits of Education* (Ann Arbor, MI: University of Michigan Press, 1997). Evidence of decreased reliance on other public programs in addition to the ones shown here is provided by Krop, 1998, and Vernez, Krop and Rydell, 1999.

Costs and Benefits of Higher Education in Kentucky

The most valuable of all capital is that invested in human beings.
—Alfred Marshall
Nobel Laureate Economist

We turn now to the central question posed at the beginning of this report: do the benefits of increasing the educational attainment of more Kentuckians beyond the secondary level outweigh the costs to our state? We consider the benefits outlined in the previous chapter and the costs of Kentucky's eight publicly supported institutions of higher education.[66]

This section summarizes the lifetime values of a selection of benefits from the previous section and describes the types of costs incurred in attending Kentucky's eight public four-year universities. Finally, it compares these benefits and costs, revealing the estimated total value to society of increasing the level of education for the typical Kentuckian from that of a high school diploma to a bachelor's degree or higher.

How much does it cost to go to college in Kentucky?

On the surface this question seems relatively simple, but higher education financing is complex. Earlier in this report we distinguished between the *instructional costs* of a postsecondary institution and the costs of its other functions, such as organized research and public service. Since this report focuses on the "going-to-college" aspect of higher education, we use instructional costs for the cost-benefit analysis.[67]

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[66] While we estimated the benefits associated with attaining a two-year degree in the previous section, they are excluded from the cost-benefit analysis, therefore so are the associated costs of that level of education.

[67] Instructional costs include only those funds expended for the payments of wages and salaries and daily plant and equipment maintenance and operation. Public funds used to pay for organized research and public service were excluded from the calculation of instructional costs per FTE. This separation of the types of costs incurred by a university or college was necessitated by the differentiation in colleges by function—research or instruction. As a means to remaining current in their field and thus

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Calculating instructional costs per student can be tricky. The usual practice is to divide the costs among students and express them on a per student basis. However, given the rise in nontraditional students and part-time attendance, the method used here calculates costs per full-time equivalent (FTE) student.[68] As noted previously, all costs are related to attending one of the eight public universities in Kentucky. In 2000 the state spent approximately $6,633 per FTE student per school year at one of the state's eight public institutions.[69] The present value of this expenditure over four years is approximately $24,626[70] and represents what the state spends to provide the average Kentucky student with a college education. In the final comparison of social benefits and their related costs, this is the relevant cost figure that should be used.

However, a higher education is not cheap, and the student and his or her family must also pay a portion of the expense. Tuition and fees are the student's "price tag" for college. In 2000, a student spent approximately $3,719 on average to attend one of Kentucky's eight publicly supported institutions.[71] Extending this expense over a four-year period and expressing it in present value terms, the total "price" of a four-year degree in Kentucky is approximately $13,810.[72]

Full-time employment is usually not an option for a student while attending college.[73] The salaries or wages a student gives up while going to school are referred to by economists as the *opportunity costs* of pursuing a degree in higher education. The average annual wage for a Kentucky man with a high school diploma or less is approximately $28,921. For a woman, the yearly wage is less, at

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improving their ability to teach in that field, faculty engage in basic research. This research does sometimes overlap with organized research. Therefore, some of the money spent separately for organized research directly benefits the student. The result is a possible underestimate here of the true costs of instruction, since the proportion of money spent on organized research that accrue directly to the student are difficult if not impossible to calculate. For more information on the treatment of the costs of higher education see Howard Bowen, *The Costs of Higher Education: How Much Do Colleges and Universities Spend Per Student and How Much Should They Spend?* (Carnegie Foundation for the Advancement of Teaching and San Francisco, CA: Jossey-Bass Publishers, 1980).

[68] There are several methods for calculating full-time equivalency (FTE), see the Glossary for further discussion of these methods. The one used here was developed by Integrated Postsecondary Education Data System IPEDS and calculates FTE as all full-time students plus one third of part-time students.

[69] All cost and student enrollment data were supplied courtesy of the Council on Postsecondary Education.

[70] This amount is slightly less than four times the yearly expenditure, to account for the time value of money. Most people prefer to have or spend money in the present rather than some time in the future, and present value calculations account for this fact. See glossary for full definition of present value calculations.

[71] Average tuition and fees is a weighted average of resident and nonresident tuition based on FTE enrollment.

[72] This may seem hefty to some, but upon comparison with other states, going to college in Kentucky is a reasonable expense. According to a recent evaluation of higher education in the states, Kentucky scored a "B" in affordability. For more information on this interstate comparison of higher education see: National Center for Public Policy and Higher Education, *Measuring Up 2000: A State-by-State Report Card for Higher Education* (Los Angeles, CA: Author, 2000).

[73] Although enrollment among nontraditional students who work full time in some cases has increased in recent years, theoretically a student pursues higher education on a full-time basis.

approximately $20,713.[74] A typical man in Kentucky will give up approximately $107,374 in wages to earn a four-year degree, while a woman will lose approximately $76,900 over this same period.

While tuition and fees and foregone earnings are important in any discussion of higher education costs, we do not include private costs in the final comparison of social costs and benefits. Earnings are a private benefit and they are not included in our definition of the "social benefits of education." Therefore, private costs should not be included on the opposite side of the ledger when comparing the total social benefits to the costs of a four-year degree or higher. The next section analyzes how the benefits stack up against the social costs of providing the typical Kentuckian with a four-year undergraduate degree.

DO BENEFITS OUTWEIGH COSTS?

As shown in Table 1, compared to a high school diploma only, a college education or higher will yield substantial expected social benefits over the lifetime of a typical Kentucky man and woman. The estimated total present value of expected lifetime benefits associated with increasing a man's education level from a high school diploma to a bachelor's degree or higher is at least $126,000. For a woman the present value of this educational increase is at least $97,000. The average cost to the Commonwealth of providing a four-year undergraduate degree to either a man or a woman is approximately $24,626. Comparing these totals with the social costs of this education indicates that Kentucky stands to gain in many areas from investments in higher education.

The traditional decision rule for a cost-benefit analysis is to proceed with the project if the benefits outweigh the costs and those benefits are greater than those of alternative projects. If this were the only project before Kentucky, then these numbers would suggest that the project go forward. However, this is not a traditional cost-benefit analysis and this is not the only item on the state's list of possible projects. Even though this is not an exhaustive analysis of all the benefits a quality postsecondary education system has to offer and we don't have the benefits of alternative investments with which to compare our results, these numbers indicate that expenditures on higher education are worthwhile public investments.

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[74] Average wages were estimated using data from the Current Population Survey for March 2000. These are the mean wages of Kentucky men and women, ages 18 and older, with a high school diploma or less. These summary measures do not account for years of experience, type of profession, or other factors influencing the wage rate. Therefore, these may overestimate the actual wage an 18- to 24-year-old may earn if not attending college, since that student would not have the years of experience that usually contribute to a rise in earnings.

They also do not take into account the possibility that a student may work part-time throughout the year or full-time during months not spent attending school. These estimates represent year-round wages even though most students do not attend school the entire year. If the two to three months not spent in school are actually spent at work, the wages earned in this employment could partially offset the foregone earnings for an entire year. In addition, a student could also work part-time throughout the year, further offsetting these full-time, year-round estimates of foregone earnings.

At first glance some of these benefits may appear small. However, these estimates are narrowly focused to represent the expected benefits accruing over the lifetime of an individual with at least a bachelor's degree or higher minus those expected benefits accruing over the lifetime of a high school graduate. Although we focus on the move from high school graduate to a graduate of a four-year degree-granting institution or higher, it is important to note that for the criminal justice system and welfare and food stamp reliance, greater savings are found with an increase from a high school dropout to a high school graduate. This helps to highlight the importance of investments in all levels of education. In addition, the welfare benefits presented here are calculated for only five years, due to the eligibility time constraints that were a part of recent welfare reforms. Even in the face of these limitations, society still enjoys savings attributable to lower demand for these programs associated with higher education.

Voluntarism alone accounts for up to $10,457 in increased societal benefits as we move the typical Kentucky man from a high school graduate to a graduate of a four-year degree-granting institution or higher. These data do not provide amounts of charitable contributions and no proxies were used to value community group participation or leadership—all of which increase as education levels rise.

Other educational benefits not shown here include those related to lower smoking rates, increased frequency of reading to children, increased access to technology, higher entrepreneurial activity and increases in voter registration. Health care expenditures attributable to smoking in Kentucky have been estimated to be as high as $1 billion annually. In aggregate, the reduction in the likelihood of smoking associated with a college education could conceivably save Kentucky millions of dollars in health care expenditures over the long run.

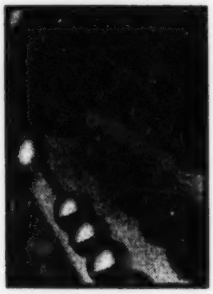
In addition, the final estimate of total benefits reveals a considerable gender discrepancy. The source of much of this gap is the difference in expected tax revenue received from men and women. These are income taxes which are tied to differences in earnings between men and women. While many studies have considered the gender wage gap, its sources and magnitude, many have identified the length of time spent in the labor force as a primary factor of this discrepancy. Women are less likely to work during all of their working-age years, often taking time from the labor force for child rearing, thereby lowering their expected lifetime earnings compared with their male counterparts.

The remaining gender differences in our calculations are tied to the higher likelihood that women will rely on public financial support while men are much more likely to be a participant of the criminal justice system. Thus, the difference in values shown here is a product of many sources used in the calculation of total expected benefits.

TABLE 1
Present Value of Expected Lifetime Social Benefits of a Kentuckian with a Bachelor's Degree or More Compared to High School, by Type of Benefit, 2000

	Men	Women
Additional Federal Income Tax	83,097	63,061
Additional State Income Tax	28,242	19,031
Welfare (5 years) Savings	190	263
Food Stamps Savings	1,773	5,397
Criminal Justice System Savings	2,367	123
Additional Voluntarism	10,457	8,949
Total Social Benefits	$126,126	$96,823

Source: Kentucky Long-Term Policy Research Center analysis, see Appendices



CONCLUSIONS

Though our ability to measure benefits associated with higher education is limited by our capability of identifying all the associated outcomes and valuing them, the evidence presented here nonetheless suggests significant returns to society as a whole. Closing the gap between Kentucky's adult population with a higher education and the nation's requires substantial investments but the results here indicate large rewards. Even this very limited analysis implies that the future returns exceed higher education expenditures. A variety of outcomes related to education are responsible for returns of this magnitude. As education increases, associated behavioral changes lead to benefits accruing to not just the individual through higher employment status and wages, but also to society as it enjoys the far-reaching effects of these changes.

Indeed, we have learned from past work that persons with a degree from a four-year institution or higher are more likely to be civic-minded and to choose healthier lifestyles. Here, we have attempted to gauge the value of these considerable outcomes, as well as others. As we have shown, college-educated individuals are also less likely to be a burden to the criminal justice system or to depend upon public welfare programs. To the extent that frequently reading to young children affects future academic performance, children of more educated parents will be better prepared upon entering school, as the likelihood of being read to every day will be greater. We also know that postsecondary education is associated with an increased likelihood that the individual will engage in entrepreneurial activity and be better prepared for the workplace of the future, whether or not they start a business. Tax revenues and, in turn, the capacity of the public sector to serve the interest of the public good, are enhanced by the higher earnings that are generally commensurate with more schooling.

While our analysis examines and discusses the benefits resulting from increasing educational attainment from the high school diploma to at least a baccalaureate degree, one should not necessarily infer that it is better or more cost effective to invest in postsecondary education than, for example, early childhood development, primary and secondary education, or vocational and technical training.

Finally, it is also important to note that this report is not intended to indicate that spending for higher education is always justified by its returns. On the contrary, all public spending arguably should be held to a higher standard in our state because it lacks the resources to finance unwise, unproductive investments. Moreover, our per capita investment in postsecondary education is relatively high.

Thus, expectations of these investments in postsecondary education are justifiably high.

If Kentucky continues to pursue policies that encourage participation in postsecondary education at the baccalaureate level or beyond, clearly it will reap the benefits of improved lives for all Kentuckians. While overall societal costs will have to rise to meet the growing demand for quality education at unprecedented levels, the expected lifetime returns should continue to outpace initial investments over the long run.

Appendix A: Kentucky Survey Data and Models

The University of Kentucky Survey Research Center conducts semiannual surveys of Kentucky residents. This report utilized data from those conducted in the spring of 1998 and 2000 and in the fall of 2000. Households on all three surveys were selected using random-digit dialing, a procedure giving every residential telephone line in Kentucky an equal probability of being called. All samples include noninstitutionalized Kentuckians 18 years of age or older. Calls for the Spring 1998 survey were made between May 11 and June 10, 1998. For the Spring and Fall 2000 surveys, calls were made from May 18 to June 26, 2000 and October 28 to November 21, 2000, respectively. In each of the three surveys the number of completed interviews were 658 in the spring of 1998, 1,070 in the spring of 2000, and 859 in the fall of 2000, with response rates of 37 percent, 51.2 percent, and 39.7 percent, respectively. At the 95 percent confidence level, the margins of error were 3.8, 3.0, and 3.3 percentage points on the Spring 1998, Spring 2000, and Fall 2000 surveys, respectively.

We use multivariate probit models and a two-part probit and ordinary least squares (OLS) regression model to estimate the relationship between the answers to the various survey questions used and the explanatory variables of education, income, age, gender, race, ethnicity, and urbanity (or rurality) of respondents' county of residence. Not all explanatory variables were used in every model.

The Data

On every survey, including the latest available survey data from the fall of 2000, the University of Kentucky Survey Research Center asks questions regarding reliance on welfare or food stamps as a source of income:

- *In the past 12 months, because of sickness, unemployment, divorce or any other reason, have you received any of the following sources of income?*
  - *AFDC (welfare)*
  - *Food Stamps*

They also ask whether the respondent is registered to vote:

- *Are you currently registered to vote?*

For all three dependent variables (WELFARE, FOOD, REGISTER), a positive answer equals one and a negative response equals zero. The number of sample participants who had used welfare or food stamps was relatively low. Therefore, data from the Spring and Fall 2000 surveys were pooled to increase the sample size and variability of these two dependent variables. The larger sample sizes yielded more reliable probit model results.

The Kentucky Long-Term Policy Research Center has been tracking civil society trends in Kentucky for the past several years with a series of questions on those surveys conducted in the spring of each year, including the most recent spring survey from 2000:

- *In the past 12 months have you volunteered your time for civic, community, charitable or nonprofit activities or church related activities?*
- *Approximately how many hours did you volunteer in a typical month?*
- *Have you made a donation to a charitable or nonprofit organization in the last year?*

The dependent variable for the first (VOLUNTEER) and third (DONATE) questions equals one if a respondent answers yes to either question, and zero otherwise. The second question is asked only if the respondent has volunteered in the past 12 months. The dependent variable (HOURS) for this question is then the number of hours the person volunteered in a typical month. The maximum response allowed was 40 hours, so as to minimize any distortions caused by extreme values.

The Center also asks a series of questions on those surveys conducted in the fall of each year regarding other aspects of civil society, including community involvement and leadership activities. In the fall of 2000 the Center asked:

- *Have you ever participated with a group of people to work together to solve a problem or need in your community (such as cleaning up public areas, neighborhood watch programs, etc.)?*
- *Were you the organizer or leader of that group effort?*
- *Have you ever participated in a leadership development program or course?*

The Center also inquires about cultural and entrepreneurial activity on these surveys:

- *Have you visited a museum, a festival, an arts performance or an historic site IN YOUR COUNTY in the past 12 months?*
- *Have you ever started a business?*

The dependent variables in all five cases (GROUP, LEADER, LEADPROG, CULTURE, ENTREP) are one for affirmative responses, and zero otherwise. The second question is asked only in the case of a positive response to the first question; therefore, the sample size is smaller than the total possible number of respondents to the survey.

In the spring of 1998 and 2000 the Center asked parents of children ages 8 years old and younger how often they read to their children:

- *Are any of your children EIGHT or younger?*
- *Do you read to your children who are EIGHT years old or younger?*
- *Do you read to your children about every day, about once a week, about once a month, or less than once a month?*

The second and third questions were asked only if the parent had children under the age of eight. Since only a small portion of the sample had children meeting this age criterion, data from the two surveys were pooled to increase sample size. There was not enough variation in the answers to the second question to model the effect of the independent explanatory variables on the probability that a parent reads to his or her children. Practically everyone in the sample reads to their small children. Only 18 of the 379 respondents with children under the age of eight answered that they did not read to their children. For the third question, if a parent reads to their children "about every day," the dependent variable (DAILY) equals one, and zero if the parent reads to their children "about once a week" or less. Therefore, the remaining three choices of "about once a week," "about once a month," and "less than once a month" were grouped together in one category.

The University of Kentucky College of Nursing asked Kentuckians about their smoking habits on the survey conducted in the spring of 2000:

- *Have you smoked any cigarettes in the past 30 days?*

The dependent variable (SMOKE) equals one if the person had smoked any cigarettes in the past 30 days, and equals zero otherwise. Generally accepted practices require more information than that provided by this question alone to establish whether a person is a smoker. However, the analysis and the implications of the results did not require the establishment of smoker status. In addition, the portion of the sample responding "yes" is approximately 30 percent, which is the approximate current adult smoking rate for Kentucky.

Excluding voluntarism, multivariate probit models were used to estimate the relationship between each outcome and the predictor variables of education, income (excluding welfare and food stamps), age, gender, race and ethnicity and location of residence.

Education. To estimate the relationship between education and the probability of the various outcomes, a series of dichotomous variables were used, with a high school diploma or equivalent as the reference group or base case. The first dichotomous education variable (LTHS) is a one if a person's education level is less than a high school graduate, and a zero otherwise. If a person has attended college without graduating or earned a two-year degree, the second education dichotomous variable (SC2YR) is one, and zero otherwise. The variable representing a college education level or higher (BAORMORE) equals one if a person has earned at least a bachelor's degree, and is zero otherwise.

Income. Income was also entered as a series of dichotomous variables with household incomes of $20,000 and below as the base case. These variables (INCOME1, INCOME2, INCOME3, and MISINC) are equal to one if a person's household income ranges between $20,000 and $40,000, $40,000 and $70,000, exceeds $70,000, or is missing, respectively. All income explanatory variables are zero otherwise. In many cases, survey respondents are uncomfortable revealing information about household income, and many of these observations are blank as a result. To keep these observations and somehow account for them in the model, a dichotomous variable was constructed, to indicate whether an observation was missing an income response. Therefore, these observations were not lost in the modeling process.

Age. The variable describing age (AGE) is a continuous variable that represents the age of each person in the sample. The age of each person is divided by ten and the squared term divided by 1000 to reduce scale problems resulting from wide ranges in magnitude between the dependent and independent variables. Age was entered as a quadratic in some models to allow the associated probability to vary with age in a nonlinear fashion.

Gender. The explanatory variable indicating respondent's gender (GENDER) equals one if female and zero if male.

Race and Ethnicity. The variable controlling for race and ethnicity (RACE) equals one if a person is white, non-Hispanic, and zero otherwise. The survey asks respondents to describe their racial or ethnic background within the following available categories: white, African American, Hispanic or "some other race." In the case of the last response, the person is asked to specify.

Location of residence. This is a dichotomous variable indicating whether the county of residence is classified as urban or rural by the Census Bureau. The variable (URBAN) is set to 1 if the county is urban and 0 if rural.

Each of these explanatory variables used to predict the probability of engaging in each activity listed is shown in Table A.1. This table gives the mean values of the dependent variables and each explanatory variable for each dataset from the

fall of 1998, spring and fall of 2000 and the pooled datasets of Spring 1998 and 2000 and spring and fall of 2000. When reading this table keep in mind that all variables, excluding age and its squared term, are bivariate—having only the values of 1 or 0. Therefore, the mean value of 0.13 for less than high school (LTHS) in the Fall 2000 sample indicates that approximately 13 percent of the sample had an educational attainment level less than a high school diploma. The rest of the values from this table should be interpreted in a similar manner. To find the real age simply multiply the mean value by ten.

On average a Kentuckian from each of these datasets is a white, non-Hispanic female, living in a nonmetropolitan area, with some college education or a two-year degree, is in her mid-40s, earning between $25,000 and $30,000 annually in household income. This is the "average" or "typical" Kentuckian discussed throughout the report and used to predict the outcomes of all graphs, unless otherwise specified. The pooled dataset used to model frequency of parents reading to their children has a lower average age of approximately 34 due to the nature of the topic analyzed.

THE MODELS

In all, 12 models were estimated using these three datasets. In estimating education's association with welfare and food stamps, all explanatory variables were used, excluding income. The probit models used in these cases are reduced form models that explain the total effect of education on the use of these programs, including its direct relationship and its indirect relationship through income. The quadratic age term was included, since income has been shown to vary nonlinearly with age in similar models and welfare and food stamps are forms of income. The remaining models, excluding voluntarism, are probit models that use all explanatory variables except the quadratic age term. Finally, voluntarism was estimated using a two-part probit and ordinary least squares (OLS) regression model that incorporated all the explanatory variables, excluding the square of age.

The probability that an individual participates in activity j (e.g. registering to vote) is estimated using a probit model. Whether or not an individual engages in one of the activities analyzed in this section is a dichotomous outcome: an individual either participates in the activity or does not. To model this behavior, the probit assumes that an unobserved variable, called Z, determines whether a positive outcome is observed. When Z exceeds a critical value, which we will refer to as Z*, we observe that the individual engages in the activity in question; when Z is less than Z*, we observe that the individual does not engage in the activity. Z is normally distributed with a mean of zero and a standard deviation of one. The probability of activity participation or engagement can be estimated by evaluating the standard normal cumulative distribution function (CDF) for the probit model's estimate of Z. The higher the value of Z the greater the probability of activity by the person observed. The unobserved variable Z is modeled by:

1) $Z_j = X\beta + \mu \qquad \mu \sim N(0,1)$

X is a set of explanatory variables, including education, age, income (in most cases), and demographic variables, and μ is a random error term. The probability that an individual shows the behavior in question is given by

2) $Pr[Y_j>0] = \Phi(Z_j)$

where Φ is the standard normal CDF.

The second part of the voluntarism model uses a linear model to predict the number of hours volunteered, conditional upon the fact the person volunteers.[75] This linear model is estimated using ordinary least squares regression methods on only those respondents that volunteer:

3) $(Y_j | Z_j>Z_j^*) = X\beta + \mu \qquad \mu \sim N(0,\sigma^2_\mu)$

The maximum likelihood estimate for the two-part model is obtained by combining the estimate for β in equation 1 with the estimate for β and σ^2_μ in equation 3. The expected number of hours volunteered is then :

4) $E[Y_{j\text{ volunteer}}] = P_{j\text{ volunteer}} * [(X\beta) + \sigma^2_\mu]$

where $P_{j\text{ volunteer}} = Pr[Y_{j\text{ volunteer}}>0] = \Phi(Z_{j\text{ volunteer}})$, and Φ is the standard normal CDF. The second part of the model produces unbiased consistent estimates of the number of hours volunteered. This formal two-part model gives the expected number of hours volunteered and these hours are then valued at the average wage rate for Kentucky in 2000.

The parameter estimates of each of the twelve models previously described are given in Tables A.2 and A.3. These parameter estimates were used in conjunction with the averages from Table A.1 to produce the predicted probabilities presented throughout the text of this report.

[75] For more on the two-part model used to predict volunteer hours refer to Naihua Duan, Willard G Manning, Jr. Carl N. Morris, and Joseph P. Newhouse, "A Comparison of Alternative Models for the Demand for Medical Care," *Journal of Business and Economic Statistics*, 1.2 (1983): 115-126.

TABLE A.1
Independent and Dependent Variable Means for Data from the Spring 1998, Spring 2000, and Fall 2000 Kentucky Surveys

	Spring 1998	Spring 1998 and 2000 (Pooled)	Spring 2000	Fall 2000	Spring and Fall 2000 (Pooled)
NUMBER OF OBSERVATIONS	658	379*	1,070	859	1,923
WELFARE	—	—	—	—	0.02
FOOD	—	—	—	—	0.07
REGISTER	—	—	—	0.88	—
CULTURE	—	—	—	0.60	—
ENTREP	—	—	—	0.27	—
DAILY	—	0.64	—	—	—
SMOKE	—	—	.31	—	—
GROUP	—	—	—	0.46	—
LEADER	—	—	—	0.22	—
LEADPROG	—	—	—	0.27	—
DONATE	—	—	0.84	—	—
VOLUNTEER	—	—	0.60	—	—
HOURS	—	—	12.02	—	—
LTHS	0.16	0.11	0.14	0.13	0.14
SC2YR	0.24	0.30	0.24	0.26	0.25
BAORMORE	0.22	0.22	0.23	0.24	0.24
AGE/10	4.68	3.42	4.65	4.39	4.53
AGE^2/1000	—	—	—	—	2.30
GENDER	0.58	0.65	0.64	0.59	0.62
RACE	0.92	0.88	0.92	0.91	0.92
INCOME1	0.18	0.26	0.15	0.25	—
INCOME2	0.19	0.24	0.21	0.21	—
INCOME3	0.09	0.12	0.13	0.13	—
MISINC	0.28	0.16	0.20	0.16	—
URBAN	0.45	0.46	0.46	0.44	0.45

* This is the number of people from both surveys who have children under the age of 8 years old

TABLE A.2
Multivariate Probit Model Estimates for Reliance on Welfare and Food Stamps; Registering to Vote, Cultural Activities, Starting a Business, Reading to Children Daily, and Smoking

	WELFARE	FOOD	REGISTER	CULTURE	ENTREP	DAILY	SMOKE
INTERCEPT	-1.53***	-1.32***	-0.06	0.35	-1.37***	0.25	0.30
LTHS	0.38**	0.65***	-0.44***	-0.47***	-0.21	-0.31	0.10
SC2YR	-0.20	-0.19*	0.45***	0.24**	0.33***	0.17	-0.10
BAORMORE	-0.57**	-1.53***	0.29*	0.49***	0.13	0.81***	-0.43***
AGE	0.06	0.07	0.18***	-0.08***	0.10***	3.42	-0.13***
AGE^2	-0.22	-0.26	—	—	—	—	—
GENDER	0.16	0.61***	0.14	0.10	-0.49***	0.13	-0.04
RACE	-0.31	-0.14	0.35**	0.08	0.12	0.13	0.18
INCOME1	—	—	0.01	-0.22*	0.40***	0.08	-0.08
INCOME2	—	—	0.58**	0.08	0.44***	-0.04	-0.18
INCOME3	—	—	0.74***	0.29*	0.79***	0.05	-0.44***
MISINC	—	—	0.01	-0.17	0.27	-0.01	-0.35***
URBAN	-0.26*	-0.32***	-0.33***	0.10	0.01	0.29	-0.04

*Note: *** indicates significance at the 1 percent level, ** indicates significance at the 5 percent level and * indicates significance at the 10 percent level or lower in a one-tailed test.*

TABLE A.3
Multivariate Probit Model Estimates for Community or Neighborhood Group Efforts, Leading Those Efforts, Participating in a Leadership Program, Donating to a Charity, and the Two-Part Model Estimates for Voluntarism

	GROUP	LEADER	LEADPROG	DONATE	VOLUNEER (PART 1= PROBIT)	HOURS (PART 2 = OLS)
INTERCEPT	0.12	-1.05*)**	-0.78***	-0.26	0.24	14.77***
LTHS	-0.26*	-0.40	-0.17	-0.61***	-0.36***	-2.69
SC2YR	0.12	0.53***	0.60***	-0.05	0.17	0.27
BAORMORE	0.42***	0.51***	0.89***	0.41***	0.48***	0.35
AGE	-0.03	0.11**	0.00	0.17***	0.00	0.27
GENDER	-0.23	0.00	-0.29***	0.21**	0.27***	-1.20
RACE	-0.04	-0.10	-0.07	0.08	-0.34**	-0.20
INCOME1	-0.10	-0.57**	-0.01	0.49***	0.31**	0.48
INCOME2	0.08	-0.35*	0.01	0.668***	0.22*	-1.46
INCOME3	0.01	-0.41	0.19	1.00***	0.53***	-0.18
MISINC	0.14	-0.47*	0.02	0.13	0.14	0.03
URBAN	-0.07	-0.17	-0.04	0.05	-0.25***	-2.16**

*Note: *** indicates significance at the 1 percent level, ** indicates significance at the 5 percent level and * indicates significance at the 10 percent level in a one-tailed test*

Appendix B: Federal and State Income Taxes

Because taxes are paid out of income, policies that increase pre-tax, pre-transfer income also should increase tax revenues. State and federal income taxes move directly with income. To estimate the relationship between educational attainment and tax revenues, we first estimate the taxes paid using income data from the March Supplement to the Current Population Survey, 2000. The base for general tax revenues is pre-transfer family income. Internal Revenue Service (IRS) data on the percentage of total taxes paid by each income group are used to estimate the state and federal income taxes paid by each family in the sample. Table B.1 summarizes the average tax rates applied to each income group. Estimated tax payments per family are then divided evenly among all family members to estimate payments per individual. An ordinary least squares regression model is used to estimate the relationship between education and the natural log of state and federal taxes for the adult sample, while controlling for other factors affecting the level of taxes paid. So, while children were included in the division of taxes among all family members, the final estimates are a result of the adult sample only. Median family income for the sample is approximately $46,000. The median yearly per person state and federal taxes paid are approximately $535 and $1,820, respectively.

Two ordinary least squares models were used to estimate the relationship between federal and state taxes and the explanatory variables of education, age, gender, and race and ethnicity.[76] The natural log of individual income tax payments were used as the dependent variables for both models. The following models estimate the amounts of federal and state income taxes, given the explanatory variables:

$$1)\ \ln(T_j) = X\beta + \mu \qquad \mu \sim N(0,\sigma^2_\mu)$$

where $\ln(T_j)$ is the natural log of federal taxes if j=1 and state taxes if j=2, X is a vector of explanatory variables, β is a vector of estimated coefficients, and μ is a random error term distributed normally with mean zero and variance of σ^2_μ. Table B.2 contains the parameter estimates of the least squares regression analyses used

[76] For more detail on the explanatory variables used in this section see Appendix A

to estimate the independent relationship between income tax payments and each of the explanatory variables used in the models.

TABLE B.1
Average 1997 Federal and State Income Tax Rates by Income Class

Size of Income	Federal Tax as Percentage of Adjusted Gross Income	State Tax as Percentage of Adjusted Gross Income
All Returns	13.0 %	3.4 %
Under $10,000	1.6	0.3
$10,000 under $20,000	4.9	0.3
$20,000 under $30,000	7.8	0.9
$30,000 under $50,000	9.8	2.4
$50,000 under $75,000	11.6	4.3
$75,000 under $100,000	14.4	5.4
$100,000 under $150,000	17.1	5.6
$150,000 under $200,000	19.9	5.7
$200,000 under $500,000	25	5.9
$500,000 under $1,000,000	29.6	5.7
$1,000,000 or more	29.7	4.7

Source: U.S. Department of the Treasury, 1998

TABLE B.2
Least Squares Regression Parameter Estimates for Federal and State Taxes

Explanatory Variables	Federal Taxes	State Taxes
INTERCEPT	6.30***	4.5***
LTHS	-1.02***	-1.47***
SC2YR	0.51***	0.62***
BAORMORE	1.00***	1.25***
AGE	0.35***	0.48***
AGE^2	-1.88*	-3.42**
GENDER	-0.28***	-0.39***
RACE	0.30*	0.36*

*Note: *** indicates significance at the 1 percent level, ** indicates significance at the 5 percent level and * indicates significance at the 10 percent level in a one-tailed test.*

Appendix C: Criminal Justice System

Expected incarceration costs for Kentucky men and women at varying levels of educational attainment were used to estimate the potential criminal justice savings associated with education. The expected cost of incarceration was a combination of the likelihood of incarceration, given a Kentuckian's age, gender and education level, and the average annual cost of imprisonment. Data on prisoners of state facilities in Kentucky were from the Kentucky Department of Corrections, 2000,[77] data on prisoners in state correctional facilities for the United States were from the *Survey of Inmates in State and Federal Correctional Facilities, 1997*,[78] and Kentucky population data were from the March Supplements to the Current Population Surveys, 1998-2000. These datasets were used together to estimate the share of Kentucky's adult population in state correctional facilities.

Data limitations hindered our use of regression analysis in estimating the relationship between education and the criminal justice system. A random sample of noninstitutionalized and institutionalized persons was not available for use in estimating this relationship. Therefore, another method utilizing the three datasets described previously was used to estimate the probability a person would reside in a state correctional facility, based on education, age, and gender.

Within each dataset, subpopulations based on age[79] and gender were estimated. Data on educational attainment were not available in the Kentucky inmate dataset. Within each gender and age group, the national incarcerated population and the Kentucky general population are estimated for four educational attainment categories (less than high school graduate, high school graduate or equivalent, some college or two-year degree, and bachelor's degree or more). To construct these categories for the Kentucky-level inmate dataset, national inmate percentages were applied. The percentage of national inmates in each gender, age, and education category were multiplied by the number of Kentucky inmates in each gender and age category to obtain state-level estimates of educational attainment of Kentucky's prison population. The number of Kentucky inmates in

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[77] Kentucky Department of Corrections, Justice Cabinet, Commonwealth of Kentucky. *Current Extract File*. Data on inmates correct as of December 11, 2000.

[78] U.S. Dept. of Justice, Bureau of Justice Statistics, and U.S. Dept of Justice, Federal Bureau of Prisons. *Survey of Inmates in State and Federal Correctional Facilities, 1997* [Computer File]. compiled by the U.S. Dept. of Commerce, Bureau of the Census, ICPSR ed. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [producer and distributor], 2000.

[79] Data on age were calculated using 3-year rolling averages.

each demographic category was divided by the number of persons in the general population in each demographic category to obtain the probability that a person, given their gender, age and educational attainment level, would be imprisoned. The present value of a lifetime of costs, from age 19 to 75, was calculated for men and women and discounted at a rate of 3.05 percent, to reflect the "time value of money."

This analysis excludes federal prisons and local jails,[80] as well as the costs of probation, parole and the court systems. Therefore, this analysis does not include the full cost of the criminal justice system. Federal prisons hold a relatively small share of the total number of prisoners and comprise a relatively small share of the costs of incarceration. While a large number of people are on probation, the cost of probation is relatively small. To the extent better educated individuals tend to be jailed in federal prisons or are put on probation, this analysis may overstate the savings associated with education.

Expected annual costs per person, given each one's age, gender and educational attainment level, were estimated by multiplying the probability that a person would be incarcerated by the average annual cost of incarceration per inmate in Kentucky. Expected annual costs vary, based solely on the variation in the likelihood that a person will be incarcerated, given each person's demographic status based on age, gender and educational attainment level.

COMPARABILITY OF STATE AND NATIONAL DATA

Since education levels were not available for Kentucky's state prison population, national data were used to estimate education shares for the state level data. As mentioned previously, the percentage of persons in state prisons for each gender, age and education category at the national level was multiplied by the number of persons in each gender and age category at the state level to obtain estimates for the education categories. The national sample was similar to the Kentucky data in gender and age. In both datasets, 93 percent of the total observations were male and 7 percent female. In addition, the percentages of men in both datasets in the age groups defined in Table C.1 were similar, with over half of the men in both between the ages of 18 and 35, a little over a third between the ages of 36 and 55 and less than 5 percent of both data sets between the ages of 56 and 75. The female percentages break down in a similar manner at both the state and national levels. Frequency distributions of all three data sets used in this section are provided in Table C.1. By construction the education percentages for the state inmate sample are the same as those for the national sample.

[80] The state data include Class D inmates who are those that are temporarily housed in local jails until space is available in a state prison. Although physically in local jails, funding support comes from the state corrections department, therefore these observations were included in the final analysis. There are 2,251 Class D felons included in this data set, representing approximately 15 percent of the total number of observations.

TABLE C.1
Kentucky State Correctional Facility Inmates, US State Correctional Facility Inmates, and Kentucky Adult Population, Sample Characteristics

	KY PRISONERS		US PRISONERS		KY GENERAL POPULATION*	
Total Number of Observations	15,217		1,045,173		8,482,663	
	Men	**Women**	**Men**	**Women**	**Men**	**Women**
Percentage of Men and Women in Each Sample	93%	7%	93%	7%	48%	52%
AGE GROUP						
18-35	52%	4%	57%	4%	16%	19%
36-55	37	3	34	2	21	22
56-75	4	0.1	2	0.1	11	11
EDUCATION LEVEL						
Less Than High School	36%	3%	36%	3%	10%	9%
High School Diploma	44	3	45	3	17	22
Some College or Two-Year Degree	10	1	10	0.9	11	13
Bachelor's Degree or Higher	2	0.2	2	0.2	9	8

** This is the general adult population ages 18 and older for a pooled data set from three years of surveys, 1998-2000. In addition, this is a weighted sample and not the actual number of observations available from the CPS.*

Note: Percentages may not sum to 100 due to rounding.

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